Women in business leadership and firm performance: a cross-country study

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DECLARATION

I, Jing Ying Luo, hereby declare that:

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ABSTRACT

This study investigates the relationship between female board and top management representation and corporate financial performance (measured i.t.o. ROA), and market sentiment (measured i.t.o. Tobin's Q). Three Western nations (the U.S., the U.K. and Germany) and two Asian countries (China and Japan), are considered, specifically with the aim of understanding the nature and extent of the relationship in each region individually, andany potential differences under different cultural environments. The study period was 2014- 2019 for the board representation analysis and, due to data constraints, only 2019 for the top management analysis. Random effects panel regression was used in the board level analysis and a multiple regression model was used to study the top management level impact. The results indicate a positive relationship between the performance measures and female representation at both the board and top management levels. However, the relationship is not statistically significant in the case of the board level analysis, but generally statistically significant for the top management analysis. The strength of the mostly positive relationships between female representation and the performance measures is generally stronger for the three Western countries (particularly for the US and the UK) compared to the two Asian countries, which could in part be due to the impact of cultural differences between them.

Table of Contents

LIST OF TABLES

Chapter 1: Introduction and Background

Over the last few decades, gender diversity has been an area of increasing focus throughout the world. During the 1950s, feminist movements in the US started promoting equal access to education for women, and that women should share equal rights to work and promotion as males within business and corporates. This implies that corporates should employ and promote employees based on merit and qualifications, rather than on gender considerations. These movements strongly improved the rights of women within the business world and have successfully promoted increased gender-equality across all aspects of life, particularly in developed countries.

Today, one would expect a much more accepting study and work environment for women compared to that of the last century. Indeed, the number of women receiving higher education and working in corporates have increased. However, the rate of women occupying crucial positions in corporates remain problematic[1]. Over the past 25 years, the number of women and men graduated from law school or business school with MBA degrees were equal in Australia or the U.S, but only approximately 12% directors in Australian or US firms are female. According to Corkery and Taylor (2012), the number of women acting as chairpersons in public companies is even lower, being a mere 3%.

One question that clearly arises considering this situation, is whether greater female representation at executive management and/or board level may be beneficial to firms, particularly in terms of their profitability, and hence, whether corporates should target greater female representation at board level and in top management. For the purposes of this study, crucial positions refer to key managerial and highly responsible roles, and in particular senior executive management positions and directors.

The reason that more female leadership may add value to businesses, is the potential behavioural differences between women and men in a management context, as diverse mindsets may benefit corporates. For example, Garfinkle (2016) has identified that, due to their more fact-based approach, males tend to be more task-oriented and directive. This goal-oriented style could be highly beneficial when the situation is urgent. Women, on the other hand, generally follow a cooperative style, by conducting conversations and active listening (Garfinkle, 2016). By pursuing collaboration and encouraging participation, employees may feel more valued in

[1] Examples include research performed by Flynn and Adams (2004), Singh et al. (2001), Lam, McGuinnes & Vieito (2012) and Terjesan and Singh (2008).

such situations, and a long-term work relationship may be established based on encouragement and understanding. Although the style of leadership may vary across genders, both should be consideredrelevant, as they may be complementary, and/or applicable under different contexts.

In the modern corporate world, both the decisions made at the board and the executive management levels ultimately have an impact on firm performance. However, these impacts result from two different potential drivers of performance. Thus, the responsibilities of the board and executive management are different. While the board is responsible for the vision, mission and strategic planning of the business and making major business decisions, executive management (including the CEO) makes operational decisions and keeps the boardinformed (Barlow, 2016). Thus, a firm's board determines its strategic direction and long- term development, whereas executive management have to turn strategic plans into action through effective execution and the smooth operation of the firm on a daily basis. It can therefore be argued that sound strategic decisions made by the board, as well as their effective implementation by executive management, may ultimately impact organisational success. Therefore, although board and top management have different roles, both potentiallyplay a role in firm performance.

Due to potential behavioural differences, women may improve board strategic decision-making and executive management execution because of their different perspectives and possible approaches to dealing with decisions and problems. It is possible that this could contribute to long-term benefits for firms, including in terms of profitability. Thus, women's detail-orientation and prudence may benefit firms' operational performance through management involvement, and their perceived cooperative leadership style may make employees feel valued and motivated. On the basis of these arguments, it could therefore be beneficial to investigate the impact on firms of greater female promotion to executive management and/or appointment to company boards (*i.e.,* at both decision-making strategicand operational levels).

Further, although women in leadership may potentially benefit corporates from both strategic and operational levels, the extent of impact may vary across countries as a result of different cultural environments and practices. Thus, culture may function as a mediator of female impact on the performance of organisations, depending on whether it inhibits or reinforces female influence in high level roles. A good example of this the difference between Asian and Western cultures, where for the purpose of this study, China and Japan are taken to asrepresentative Asian nations, while the U.S., the U.K. and Germany represent Western culture.

If a culture is more open-minded, individualistic and free spirited, such as that of the U.S or the U.K., it may encourage women to be more outspoken and bolder, as is the perception of their male counterparts. Under this culture, women may tend to express their voices freely and be more able to raise differing opinions and views. On the other hand, if the culture is not supportive of women's participation in important decisions, or its traditions value reserved women, the impact of women's opinions may be limited. In addition, women may even tend to withdraw themselves from such involvement and become tokens on boards or at management level. Kanter (1993) explained in his study that female directors may feel more pressured to perform due to their "visibility" on a board, and that this could therefore result in worse performance and affect firms negatively due to tokenism. Asian culture may be such an example. Thus, it is further worth investigating whether the correlation (if any) between female representation and firm performance is consistent across different countries with varied cultural backgrounds.

Based on the above arguments, a cross-country comparative analysis between Western (U.S., U.K. and Germany) and Asian (China and Japan) nations is performed in this study to analyse potential cultural effects on the impact of female top management and board representation. Although the relationship between female board membership and firm performance has been investigated for some developed nations such as the US, research in this field is very limited, including for the Chinese region, perhaps because in China female participation in management is a relatively new phenomenon. The cross-country comparisonconducted on this study, which includes China, has to the author's knowledge not been done before.

Firm performance can be defined in many different ways, but in this study the focus is on financial performance measures, as well as on market sentiment towards corporates. According to Terjesen, Couto and Francisco (2015), ROA and Tobin's Q are good measures of financial performance and market sentiment, respectively. Tobin's Q is a market valuation indicator that is an indirect indicator of expected future firm performance, and whether the market believes the firm will increase shareholder value in the future. ROA serves as a common accounting measure to evaluate a firm's financial performance (Terjesen, Couto & Francisco, 2015).

1.1 Problem Statement and Research Questions

In view of the above, this study investigates the relationship between female representation in business leadership (specifically representation at board level and in executive management) and corporate performance, both from the financial performance and market sentiment perspectives. It further compares how such an impact may vary across selected countries with very different cultural backgrounds and investigates where there are trends in this over time.

In particular, this study seeks to explore the following questions:

1. Is there a correlation between female board representation and firm performance for the listed firms in the countries examined?
2. Is there an association between female senior management representation and firm performance of selected corporates in each selected country?
3. Does the relationship between female board and senior management representation andfirm performance differ between selected Asian and Western countries?

1.2 Thesis Map

The remainder of this document is structured as follows. Chapter 2 provides an overview of both the theoretical base of this research study, as well as empirical evidence from academic literature on the topic. This is followed by Chapter 3, which discusses the data and methodology used to conduct the research. Next, Chapter 4 discusses the results and their analysis, including a cross-country comparison. Finally, Chapter 5 concludes.

Chapter 2: Literature Review

There exists a perception that men and women, as a generalisation, tend to think and behave differently in certain situations. Thus, it can be argued that greater female representation in firms' senior management may affect their financial and market performance. In addition, different cultural value systems may affect women's behaviour and influence in a corporate context, and thus mediate the extent of females' impact on firms' performance. This chapter outlines the theories, arguments and empirical evidence on gender differences in a business context, empirical evidence on the relationship between female representation at senior levels in corporates and their financial and market performance, as well as possible cultural effects on this.

2.1 Gender Differences in a Business and Management Context

Men and women have always been thought of as possessing different characteristics, which therefore imply that they may also behave differently in the corporate environment. From a psychological perspective, men are generally considered to be more prone to risk-taking and being assertive, whereas women tend to be associated with empathy and prudence.

Thus, for example, Del Giudice (2015: 753) argues that men are more risk-seeking, tough-minded, emotionally stable and assertive. Women, on the other hand, are considered to be warmer, risk-averse and tender-minded. In addition, women are more associated with feelings and emotion, whereas men tend to be more open to abstract ideas. Del Giudice (2015: 754) further found that males form competitive groups under an environment with stable hierarchies and limited emotional investment requirements. Female groups, on the other hand, tend to be more emotion-based, and their competition less confrontational. Lastly, this study found that women have superior communication skills compared to men.

The behavioural differences mentioned above regarding risk-taking is empirically supported by the findings of a study by Faccio, Marchica and Mura (2016: 193), using an experimental approach and a large sample of privately held and publicly traded European companies, consisting of 18 European countries from 1999 to 2009, including Germany and United Kingdom. It was found that female CEOs tend to make less risky financing and investment decisions than male CEOs. Furthermore, risk-taking choices of corporates tend to reduce significantly in both economic and statistical manners when transitions from male to female CEOs occur. In addition, Fessler (2018) also argued that women tend to have a lower financial risk tolerance than men and make better investment decisions. These results seem to implythat

women (in general) are more prudent and risk-averse than males. Further gender-based differences are highlighted by Annis and Nesbitt (2017), who indicatethat men follow a fact-based approach to eliminate options and tend to seek solutions directly, whereas women are seen as preferring an intuitive approach in which they first establish an understanding of the broader background through perceiving people and events at a deeper level.

Similarly, Garfinkle (2016) also argues that men base their decisions on facts, and that this approach could be highly beneficial when opportunity is present in a timely manner. However, such decisions may lack prudence and caution when risks are involved, or when a softer "humane" approach is required. This process may therefore lead males to make rational decisions through the effective elimination of issues but could reduce their consideration of feelings and emotions. In terms of firm performance, these decisions may bring positive financial rewards, but increase a firm's risk exposure. However, as modern business increasingly moves towards a stakeholder orientated approach, as opposed to short term profitability only, it may become more important for corporates to be sensitive to other emotional factors when considering strategic decisions.

Thus, women may be more likely to make decisions intuitively through the establishment of an understanding of the broader context and impacts, although this approach may cause themto personalise issues. This may involve a conversational and cooperative approach, which enables women to understand the underlying emotional impact at a deeper level and considerthe long-term internal and external societal effect on business, which could lead to firm decisions that attempt to better balance financial and societal factors (Budhwar et al., 2005).

It has been questioned, however, whether these presumed behavioural differences between the genders persists in positions of leadership. Bosak et al. (2004) conducted a study on a sample of management students of both sexes from Australia, Germany and India, to estimatethe person-oriented and task-oriented leadership traits that exist in three stimulus groups, namely executives with no gender specification, male executives and female executives. All three countries indicated a preference of a less traditional view of leadership. In addition, similar self-descriptions in terms of person-oriented and task-oriented traits were found for both the male and female management students, thus indicating that any differences that may exist between the genders may disappear in positions of management.

This differs from the view of Goh (1991), who found that men tend to perceive themselves as more assertive than women in the workplace. Thus, males tend to place more emphasis on

career success and advancement than home life, whereas women in general have the opposite view. Thus, when women work under male supervisors, they tend to experience lower job satisfaction than their male colleagues.

Bosak et al. (2014) found that a view that a female leadership could be more competent due to a higher degree of person-orientation amongst women than men was shared across some cultures. Furthermore, Burke and Collins (2001:244) concluded that female leaders tend to lead in a more collaborative manner. In their study, female accountants were more likely to indicate that they tend to follow an interactive leadership style than males. Some managementskills found to correlate with success were utilised under this leadership style. In addition, a higher perceived effectiveness in both coaching and developing and communicating were found in women than men, again based on self-reporting.

Due to a collaborative and participatory leadership style and greater empathy, women may encourage employees and provide greater mental support in the teamwork environment than men. This ability to support and motivate employees may help the female managers to achieve higher degrees of cooperation from the employees in the workplace. These skills maybe more relevant in a modern business environment and could ultimately benefit corporates in the long term.

Overall, there may be some fundamental differences between men and women, which could result in different but possibly complimentary approaches to situations and decision making. It may therefore be beneficial to firms to have access to the different perspectives, approachesand skill sets potentially offered by women. Sufficient female participation at various levels of organisations may therefore hold benefits that go beyond just moral arguments.

2.2 Female Leadership Impact on Firm Performance

In an increasingly complex business world, inputs from different mindsets may be required to form a thorough and competitive strategy. Since men and women potentially think differently, gender diversity in decision-making roles could be one of the ways to respond to increasingly rapid changes.

Various studies have been conducted, mostly in developed countries, to indirectly test the validity of this theory by investigating the relationship between female representation (usually at board level) and company results. Although mixed results were found, most published studies suggest that gender diversity on board or management level is a factor in company performance.

A range of studies have investigated whether the presence of female directors at board level affect company performance. These studies include both cross-country and an individual country study. For example, Terjesen, Couto and Francisco (2015) conducted multi-country research using data from 47 countries and 3876 public companies. It was found that firms with more female directors tend to achieve better performance in terms of both market (Tobin's Q) and accounting (ROA) measures (Terjesen, Couto & Francisco, 2015). A further cross-country study, conducted by the Credit Suisse Research Institute (CSRI) in 2012, investigated the link between female board presence and specific firm attributes for 2400 large-cap public companies from 2005 to 2011. The study reported that companies with more than one female director outperformed those with none by 26% over the six-year period.

Further, firms with at least one woman on their boards exhibited lower leverage, a faster reduction in gearing, a 4% higher return on equity (ROE), a price to book value ratio of a third higher, and a higher net income growth in comparison to the firms with no female board members (CSRI, 2012). The cross-country evidence above not only appear to support the view that gender-diversity at board level may bring financial benefits but indicates that this general positive female impact could apply across different cultures.

At individual country level, the earliest studies in the field mainly focussed on developed countries. Erhardt, Werbel and Shrader (2003) analysed 127 US companies for the period 1993 to 1998 and found a positive association between board gender-diversity and financial measures. In the United Kingdom Trinh et.al (2018) similarly found strong evidence to support the positive impact of the female board representation on firm performance in a studyof 96 public firms listed on the London Stock Exchange between 2006 and 2016. The authorsgave some credit for this to UK governance initiatives, which have as goal at least a third female board representation by the end of 2020.

Moreover, a study of Chinese listed firms over the period 2000 to 2011 by Luo, Xiang and Huang (2017) came to the conclusion that the higher the number of female directors in Chinese firms, the lower the levels of real activities manipulation is. Real activities manipulation referred to any real adverse economic impact on firm's profitability and growth in the long term due to altering the timing and scaleof operations or any investing or financing transactions (Luo, Xiang & Huang, 2017). This relationship strengthened with increased female director ownership of the firm.

Apart from the general improvement in financial measures, Bernardi, Bosco and Landry (2014) examined 341 corporations ranked in the Fortune 500 between 2006 and 2012, and found that

the more female directors on a firm's board, the more likely it was to appear onrecognition lists, such as the most ethical or best companies to work for.

However, some researchers have found evidence that contradict the above findings. Thus, Adams and Ferreira (2007) studied US publicly traded firms from 1996 to 2003 and found that the average effect of gender diversity could be negative for firms with good corporate governance. Similarly, in a study using a sample comprising 92.4% of listed firms on the Indonesian Stock Exchange, Darmadi (2010) could not find any evidence that female board representation is associated with improved levels of firm performance, from both accounting (ROA) and market (Tobin's Q) perspectives

Although evidence on the relationship between female board representation and company performance is mixed, the majority of findings suggest a positive correlation, across a number of countries. However, the success of the promotion of gender-diversity on boards depend on the level of firm corporate governance and general governance culture in a specificcountry. Further, although most studies have thus far empathized the impact of female board representation on firm performance, a comparatively unexplored question is whether female involvement at top management level is similarly associated with better firm performance. Whereas the board determines firm strategy and influences its long-term plan and its execution, top management is responsible for a more detailed execution plan and task- allocation, as well as the close monitoring of operations. Theoretically, therefore, both the board and top (executive) management should affect the success of the firm.

Reinert, Weigert and Winnefeld (2016), in a study of all the credit institutions in the Grand Duchy of Luxembourg from 1999 to 2013, found a strong association between the proportion of women in top management and organisational performance. From a financial perspective, an increase of 10% women in top management increased future expected ROE by 3%. This positive relationship was found to be stronger during periods of financial crisis compared to normal market conditions.

Further, organisations were found to be most successful at an optimal ratio of 20% to 40%. In a similar study, Dezső and Ross (2008) investigated the relationship between female management and market sentiment (provided byTobin's Q), using a sample of American firms selected from the S&P ExecuComp database for the period 1992 to 2006. It was found that less than a third of the largest U.S. firms had any female senior executive, but a positive relationship was found between female executives management representation below CEO level and firm performance. However, this was notfound at CEO level.

A similar trend was discovered for Asian corporates. For example, Liu, Wei and Xie (2014), in a study of Chinese listed firms for the period 1999 to 2011, found a stronger positive correlation between firm financial performance and female executive directors than the female independent directors. This could imply that when women are in top executive positions, they possibly contribute more through decision making and directing implementation of key actions, as opposed to purely monitoring executives in the roles of non-executive directors. This could further imply for women in key managerial positions in Chinese firm, a stronger executive impact effect may outweigh their board monitoring impact.

Similar evidence exists for Japan. Thus, Nakagawa and Schreiber (2014) analysed 745 Japanese-listed firms in 2014 and found that both the female manager ratio and overall gender diversity of the workplace and managerial positions showed a robust positive relationship with corporate performance, after controlling for variables such as industry, firm size, capital structure, corporate governance and compensation policy. The relationship discovered was non-linear, which suggested that the benefit to corporates of increased female representation at managerial level gradually decreases. This could indicate that management gender diversity is beneficial to corporates, and not necessarily female representation *per se*.

However, not all researchers found evidence of a positive relationship between female representation at managerial level and firm performance. For example, on top of claiming a positive association between female chairman and firm value, Trinh et.al (2018) has suggested a negative link between female CEOs and firm value, after they investigated the value of UK FTSE100 stocks from 2006 to 2016.

Trinh et.al (2018) provided evidence that female directors on board could positively affect the firm value (Tobin's Q). Lam, McGuinness and Vieito (2012) also reported only limited evidence between CEO gender and firm performance in a study of Chinese corporates. Their argument was based onmore than 10000 firm-year observations from 2000-2008, but they also indicated that femaleCEOs may be more likely to emerge when there is at least one female director on a companyboard. Further, international cross-listing does not seem to materially improve gender- diversity. Overall, though, most findings seem to reflect a positive trend between female managerial level representation and firm performance, which may suggest that developing female managerial talent could be a competitive advantage for firms. However, although the benefits of women at board or management level is supported by the findings of many studies, this may be constrained by how female business leadership is perceived, as well as the possible presence of cultural and other barriers.

Women could face many potential barriers when they pursue senior leadership positions. One of the main barriers could be the perception towards women as less suitable and experienced than men to fill leadership positions. The prejudice towards female leaders based on role congruity could lead to less favorable attitudes towards women in leadership positions and further result in barriers to women becoming successful leaders (Eagly & Karau, 2002). The potential lack of promotion to leadership positions for women could further hamper their leadership skills and experience. In addition, cultural and societal norms also lead to males usually being perceived as leaders, or acquiring leadership qualities (Alqahtani, 2019).

Major barriers also exist on the supply side. Work and family balance cost women when they pursue high-profile careers or leadership roles. In the study of career advancement of MBA students from the University of Chicago, Bertrand, Goldin and Katz (2010) identified motherhood as the major factor that leads female MBA students to discontinue their careers or have shorter working hours, which led their earnings to diverge from their male fellows.

However, this does not mean that women would not be accepted as leaders, particularly on corporate boards. Marnburg, Mathisen, and Ogaard (2012) studied 491 directors from 149 boardsof directors in Norway and found that there was little difference in how boardroom dynamics were perceived by female and male directors, respectively. Their findings also revealed that female chairpersons experienced different dynamics compared to other female directors. These results were interpreted that, in Norway at least, female directors are welcomed on board and generally not perceived as outsiders. Dunn (2012) further analysed how female directors in Canada break barriers into all-male boards. Based on a sample of 193 Canadian firms over the period 1996 to2004, it was found that for women to break the barriers into the boardroom, they require either firm-specific knowledge or need to become support specialists with expertise in specific financial or legal fields. In Italy, Barth, Cebula and Rossi's (2017) study, based on 369 firm-year observations of non-financial public companies in Italy during the period 2005 to 2013, indicated that women take on complementary roles with some level of tokenism. However, these researchers also found that leverage of corporates increased when there is a higher proportion of women on board, implying that at higher levels their complementary role in monitoring agency costs weaken.

Although again mixed, some of these findings may imply an improved level of acceptance in some corporate cultures of female leaders, and a degree of acknowledgement of women's' contributions towards corporate leadership levels. However, it should be noted that these studies were mostly conducted in a Western context, and it is therefore worth considering the

effect of different cultures on female top leadership's impact on business performance, including in Asian countries.

According to Balasubramanian (2011), the importance of addressing gender-diversity in corporate leadership is two-fold and leads to both corporate and social benefits. Firstly, increasing female representation may benefit firms through improved decision-making processes, and thus may achieve better corporate governance and firm performance.
Secondly, since women form approximately half of the human resource pool, they should be entitled to the proportionate right to contribute to corporate governance and performance, as an issue of social equity.

2.3 Cultural Differences and Female Leadership

The positive association between female leadership and organisational performance is supported by evidence from much of the developed world[2]. However, a question that arises is whether this association is affected by the specific cultural backgrounds of different nations. Thus, in the literature on the cultural values of Western and Asian countries[3], it is possible to find some major cultural differences that could lead to different views of females' positions within corporates.

According to Datesman (n.d.), Americans believe that every individual should have an equal chance for success, regardless of their backgrounds, race or gender. However, on the other hand, Americans tend to believe that everyone should be responsible for taking care of themselves and solving their own problems without reliance on others. Similar values are rooted in the UK. Lander (2016) argues that the "Fundamental British Values" include democracy, rule of law, equality of opportunity, mutual respect and tolerance towards different beliefs and faiths. Under these value systems, women would be more likely to receive equal opportunities and be treated equally in the workplace.

Further, a belief in equality of success should lead to society evaluating an individual on qualification and merit,rather than gender. In such an environment, women may be expected to be more independent and willing to express their opinions freely when placed in senior positions. Without such anenvironment, the impact of female leadership within corporates is likely to be limited.

[2] Examples include studies performed by Erhardt, Werbel and Shrader (2003), Trinh et.al (2018), Reinert, Weigert and Winnefeld (2016), and Dezső and Ross (2008).
[3] For the purpose of this study, America, the U.K. and Germany were selected to represent key Western cultures, and China and Japan to represent Asian cultures, due to the political and economic influence of these nations.

Adams and Ferreira (2009) analysed American publicly traded firms from 1996 to 2003 and found that the presence of female directors on boards significantly affect board input and firm outcomes. Thus, female directors had better attendance records than male directors, and further resulted in a positive effect on male attendance compared to firms without female board members. In addition, it was found that more gender-diverse boards were more likelyto focus on monitoring corporate performance, and that women tend to join monitoring committees more often than males. This may be linked due to a more open US culture that encourages women to be outspoken and make a difference.

However, some studies suggest that, despite female board participation having an impact inthe US context of liberty and equality, US women are still extremely underrepresented at board level. For example, Flynn and Adams (2004), based on a sample of American corporates on both the Fortune 500 and Fortune 501-1000 indices, found that women's representation on boards ranged from 10 to 12%. This trend dropped for companies in Fortune 501-1000, with Chicago having only 8.4% female board representation and Philadelphia having 9.2%. This survey also found that although over 50% of companies thatresponded had at least two female directors, 10% of firms had no women in the boardroom.

A similar situation was found to exist in the UK. Thus, Brammer, Millington and Pavelin (2007) found that there is limited ethnic and gender diversity across UK corporate boards, especially at executive levels. However, some cross-sector variation was found in terms of gender diversity, with the retail, utilities, media and banking sectors displaying above average metrics. These researchers speculated that this could be due to the influence of the external environment, in which a closer proximity to final consumers strongly shape board diversity.

Furthermore, the Cranfield School of Management has conducted research over the past decade to analyse the growing trend of female board participation in the U.K. Based on FTSE100 companies, Singh et al. (2001) conducted one of the earliest studies in this series, and found that firms with at least one female director decreased between 1999 and 2001 (64% of FTSE 100 firms in 2001), but had increased again by 2005 (78% of FTSE 100 firms).

Further, between 2000 and 2005 the percentage of female executive directors were between 8% and 13%, but had increased to 18% by 2010, although only 7.8% of firms hadwomen directors across FTSE 250 companies. The low rates of female involvement in leadership positions in the US and UK seems inconsistent with the equal and free cultural values these countries claim to uphold, but these numbers are still higher than for German and Asian corporations.

Germany, a large Western economy, is often seen as having a more conservative value system compared to both the UK and the US. Bayer (2018) argued that in addition to the fundamental German value system that includes respect for human rights and strong civil society, Germany seems to hold rigid bureaucracy at its core, which he sees as a contradiction in a highly progressive and developed country. Bayer (2018) further stated that the antiquated family policy in Germany makes it difficult for women to balance work and family, thus making it more difficult for them reach higher levels of career achievement. However, this does not imply that German women necessarily are more reserved and downplay their work life, particularly as the established respect for human rights in the German cultural system could be conducive for German women making their voices heard in the workplace.

In order to further promote gender-equality in German corporates, the German government in 2016 legislated a requirement that at least 30% of the boards of publicly listed German companies has to be female (Anger, 2018). In line with this requirement, Anger (2018) showed that in 2017, German listed firms had achieved a female board presence of almost 32.6%- an increase of 57.2% from 2013 to 2017. Therefore, although women in Germany may live under a more conservative value system than that of the US or the UK, the German respect for human rights and awareness of gender equality supported by law may still allow women to have influence in the workplace. This may possibly lead to greater female influence at senior levels.

The above sections focused exclusively on Western societies, but it is also worth exploring literature on how Asian cultures respond to female involvement at leadership level, and the status of female representation at leadership level in Asian corporates. For example, China, as the most influential Asian country, has very traditional and reserved cultural values when compared to Western values. Bryant (2019) argued that Chinese culture values hierarchy and group interests, as opposed to Western culture, which respects individual rights and is comfortable with a flatter societal structure. Whilst Chinese culture requires that individual achievement and success should be downplayed, especially in the workplace, in Western culture this behaviour is sometimes viewed as weakness. In addition, the Chinese value relationships and prefer to avoid confrontations. In this context, Chinese women may feel that voicing their different opinions would damage their relationships and reputations, and they therefore may appear more reserved and not express their opinions as freely as Western women do.

Empirical evidence in this field is limited, but Liu, Wei and Xie (2014), in their analysis of Chinese listed firms' boards from 1999 to 2011, found that the impact of female directors on

firm performance was stronger in legal person-controlled firms than state-controlled ones. This was attributed to hierarchy and control of speech generally being more acceptable instate-controlled firms.

Historically, China has had a relatively low rate of female employment at key managerial roles or at board level. A study by Lam, McGuinnes and Vieito (2012) of Chinese firms for the period 2000 to 2008 indicated that only 4,4% of these firms were led by female CEOs. Further, these female leaders generally received less compensation than males. However, this study also found that over this period the percentage of female CEO-led companies was onthe rise, especially in privately owned firms. This was thought to be consistent with the theory that competitive forces would lessen discriminatory pressures. This trend is possibly driven by an increased self-awareness of Chinese women and the increased adoption of Western feminist concepts, which may transform corporate cultures into a more female- supportive environment, as well as by the authorities' gender-equality policies.

Japan, as a developed country in Asia, shares a similar but more modest value system than China. Evason (2016) argued that in Japanese tradition, group orientation and harmony are the most respected values. Thus, Japanese culture emphasises politeness, harmony and modesty in interpersonal relations, and it is rare for Japanese to express strong opinions or contradict others openly, especially at the workplace. As with Chinese firms, employees value group success and orientation more than their personal achievements in Japanese corporates. In addition, Japanese society prefers women to be more reserved and focused on family responsibilities. A Japanese national survey conducted in 2016 found that 44% of men and 37% of women in Japan still agree that women should take primary responsibility for the family, while men should be responsible for earning income (Kano, 2018). Although the figure is much lower than in the 1970s, when more than 70% of men and women believed in the separation of gender roles, this may still reflect societal expectation towards Japanese women in recent times. This could be due to the widespreadview in Asian countries that the priority of women should be family responsibility, rather than career progress. Due to the traditional values and societal expectations, women are sometimes treated as of lower worth if they are past young and marriageable age in Japanese society, which could further lead to discrimination and contradictory standards towards women in the workplace (Lebra, 2007). This has indirectly led women to relegate themselves to low-paying jobs in order to fulfil their nurturing roles. This could be a reflection of Japanese views of women's role in society, in which women are viewed as mild family nurturers instead of powerful leaders in workplaces. In line with the above, a

lower rate of female representation (and hence a lower level of influence) would be expected at senior levels in Japanese corporates. Indeed, a survey performed by Terjesan and Singh (2008) confirmed that Japan only had 2% female presence on corporate boards.

In general, Asian nations, although rapidly developing, display a much lower female participation in management positions, especially at leadership levels, when compared to the Western countries (Rai, 2012). The above may imply that American, British and German women on board and top management may tend to be bolder and more outspoken than their Asian equivalents, as their societies encourages gender-equality more. On the other hand, the nature of Asian cultures may lead to a lower impact of increased female representation on businesses compared to the Western nations examined. As a result, the cultural constraints on the ability of women to impact businesses at leadership level can be expected to result in differing relationships, and strengths of relationships, between the percentage of women in leadership roles and measures of firm performance across these various countries.

2.4 Hypotheses

The above theoretical and logical discussion, together with empirical evidence, leads to the following hypotheses, which form the basis of this study.

Hypothesis 1: female board representation and firm performance

$H1_0$: Greater female representation at board level is not positively associated with firm performance as measured by market and accounting measures

$H1_a$: Greater female representation at board level is positively associated with firm performance as measured by market and accounting measures

Hypothesis 2: female executive management representation and firm performance

$H1_0$: Greater female representation at executive management level is not positively associated with firm performance as measured by market and accounting measures

$H1_a$: Greater female representation at executive management level is positively associated with firm performance as measured by market and accounting measures

Hypothesis 3: female leadership representation and country-effects

$H1_0$: The strength of the relationship between female representation at both board and executive management level and firm performance as measured by market and accounting measures, does not differ across various countries/cultures

$H1_a$: The strength of the relationship between female representation at both board and executive management level and firm performance as measured by market and accounting measures, does differ across various countries/cultures

The contribution of the study is therefore to address specific gaps in the literature identified from the above analysis. Specifically, prior literature focused mainly on the impact of female board representation on firm performance in developed countries, and to a very limited extent on the gender impact at top management level. In the light of this, this study seeks to add value by indirectly investigating the potential cultural the impact of female board and top management representation through comparison across selected Western and Asian countries. In particular, this study includes China, where little prior literature is available, specifically on the link between Chinese female participation in top management and firm performance. This cross-country comparison, including China, that touches on the cultural context, has to the author's knowledge not been addressed in the past.

Chapter 3: Research Design

This chapter discusses the research design, consisting of the sampling, data collection and statistical methodology used in this study to test whether there is a relationship between female board and senior management representation and company performance across countries.

3.1 Sampling and Data Collection

The sample data used comprised of all listed firms that make up the major stock indices in China (the CSI 300), the US (the S&P 500), the UK (the FTSE 100), Germany (the DAX 30), and Japan (the Nikkei 225). The selected indices consist of the largest capitalisation stocks on the relevant exchanges, and therefore represent a significant part of the respective countries' economies.

The data used in this study included firm financial performance and market sentiment measures (ROA and Tobin's Q) and female representation measures (the percentage women on firm boards of directors, and the percentage of female executives). In addition, total assets,board size, the debt to equity ratio and total assets turnover for each firm were collected as control variables. These variables are indicators of firm size, board size, leverage and asset turnover, respectively. The above data was sourced from the Bloomberg terminal, an international data base providing standardised data, and hence improves the reliability and replicability of the study.

Prior to 2013 board gender composition data was not available for most Chinese companies, and as a result data across the regions was collected from 2013 onward until 2019. However, in this study the dependent variables were lagged with regards to the independent variables, and for the part of the study related to female board representation the analysis period covered was therefore from 2014 to 2019.

Therefore, although the original data collected ran from 2013 to 2019, the actual test period ran from 2014 to 2019 as a result of the one-year lagbuilt into the methodology. However, the analysis of female impact on firm performance from a managerial perspective was conducted for 2019 only, as data on female executive representation for the majority of the countries considered was not available prior to that year.

Firm years were removed from the original sample if any data point for one or more of the variables was missing for that year. The majority of data missing for China related to the variables measuring board size and the percentage of corporate boards that are female. The missing data occurred randomly and throughout the chosen period. For US corporates most

missing data loss also related to the board size and female board percentage variables, as well as to the level of leverage in the early years of the period. For the remaining three countries (Japan, the UK and Germany), in addition to female board percentage, the main source of missing data was the level of leverage. This applied throughout the entire test period.

For the board-focussed study, the one-year lag approach led to all the firm years for 2013 being excluded, as well as companies that were only listed for one year of the sample period.For the executive-focussed study, the control variable that accounts for the size of the board was not considered, as the large number of missing observations under this variable across the firms would have reduced the already small sample to a size that would have been unsuitable for analysis. This is therefore a limitation of the investigation of the female executive impact due to data constraint.

Table 3-1 below indicates the reduction in the number of observations from the original data points to the final sample due to missing data and/or the lagging effect for the board-level study. Table 3-2 shows the same for the managerial (executives) representation analysis. Notethat the number of observations in the original sample for the female board representation analysis was for the 2013 to 2019 period, and that of female executive representation analysiswas for 2019 only, hence the large difference between the number of observations in the original and final samples.

Table 3-1: Sample Process (Female Board Representation Analysis)

	China	Japan	US	UK	Germany
Number of observations in original sample	2099	1575	3526	708	210
Sample reduced by:					
Data shortage or missing data	(161)	(67)	(1829)	(65)	(3)
Firms with only one-year observation	(86)	(7)	(67)	(16)	(0)
One-year lagging effect	(389)	(232)	(476)	(118)	(34)
Number of observations in final Sample	1463	1269	1154	509	173

Table 3-2: Sample Process (Female Executives Representation Analysis)

	China	Japan	US	UK	Germany
Number of observations in original sample	300	225	505	101	29
Sample reduced by:					
Data shortage or missing data	(1)	(8)	(25)	(6)	(1)
Number of observations in final Sample	299	217	480	95	28

3.2 Regression Variables

3.2.1 Dependent Variable – Firm Performance

Firm performance was the dependent variable in this study. In line with the studies of Adams and Ferreira (2007) and Terjesen, Couto and Francisco (2015), this was measured as either a market valuation indicator (Tobin's Q), or an accounting-based measure (the return-on-assets ratio or ROA).

Tobin's Q was defined as the value of total assets less the book value of equity, plus the market value of equity, divided by the book value of total assets. If Tobin's Q is greater than1, it implies that the market believes that the firm will increase shareholder value in future. However, if it is less than 1, the market expects the firm to underperform in future (Terjesen, Couto and Francisco, 2015). The natural logarithm of Tobin's Q was taken to address the non-normality of the residuals, consistent with the research conducted by Terjesen, Couto andFrancisco (2015).

ROA serves as a commonly used financial measure to evaluate firm performance from an accounting perspective. In line with the research done by Adams and Ferreira (2007), ROA is defined as net income divided by the average of total assets.

3.2.2 Variables of Interest – % of the Board or % of Senior Executives that are Female

The variables of interest used in this study were the percentage of firm boards that werefemale, and the percentage of firm top executives that were women. In this case, female executive implies any female who functions at top-management level with the responsibility to manage critical corporate affairs and have the authority to make decisions within specified boundaries. This could include, but is not limited to, the roles of Chief Executive Officer

(CEO), Chief Financial Officer (CFO), and executive vice presidents. The above caters forboth research dimensions, namely the strategic and operational impact of females on corporate performance through, respectively, board or top management representation.

3.2.3 Control Variables

In order to perform the analysis, a number of variables known to be associated with firm performance were controlled for. This study therefore controlled for firm size, size of the board, level of leverage, and assets turnover, with these variables being lagged by one year.

3.2.3.1 Firm size

Firm Size was measured by the book value of total assets. The positive relationship between firms' total assets and Tobin's Q was well documented in the research done by Carter et al. (2010). In addition, Lee (2009) provided evidence that the profitability of firms is positively correlated with the size of the firm. The main reasoning behind the positive relationship was outlined by Sila, Gonzalez and Hagendorff (2016), who argued that larger firms are less risky, which could affect firm performance and valuation. This could imply that firm size should be controlled for, as it may affect firm performance significantly. The natural logarithm of firm's total assets was thus used, and the logged values were used as a proxy for firm size, inline with the past research[4].

3.2.3.2 Board Size

Board size measures the size of the corporate board, i.e. the number of directors on board. A study performed by Jackling and Johl (2009) found board size was to be significantly related to firm performance. This was driven by the argument that a larger board improves firm performance because it increases the information available to the board when making decisions. However, Guest (2009) argued otherwise when he found that board size of is strongly negatively correlated with firms' profitability level and Tobin's Q, as well as their share returns. Garg (2007) similarly provided evidence of an inverse relation between board size and firm performances. The main argument was that a larger board may experience moreproblems of poor communication and decision-making, which would undermine its effectiveness (Guest, 2009).

3.2.3.3 Level of Leverage

The *level of leverage*, defined as the ratio of total debts to total equity, is another variable that is strongly related to firm performance, as suggested by the research of Campbell and

[4] Terjesen, Couto and Francisco (2015) and Trinh et.al (2018).

Vera (2008). However, Raza (2013) found contrasting evidence that supports a negative relationship between leverage and firm performance, especially profitability. He argued that long-term debt would be more expensive due to direct and indirect costs, which leads to lower profitability when the level of debts is high. Interestingly, Ibhagui and Olokoyo (2018) discovered that although leverage was negatively related to firm performance, this relationship was stronger for smaller-sized firms. As the firm size grew, the negative effect would diminish gradually. Thus, in order to control the effect of leverage on financial risk, the level of leverage was used as a control variable in this study.

3.2.3.4 Firm Efficiency

Firm Efficiency was measured through the ratio of turnover to assets. A study by Muritala (2012) found evidence that assets turnover has a positive relationship with firm performance. In particular, he suggested that firms that utilise more tangible assets would be less likely to experience financial problems. This significant positive impact of assets turnover on firm financial performance measures, including ROA, was confirmed by the research of Pouraghajan and Malekian (2012). Based on this evidence and arguments, this study controls for *firm efficiency* in the form of asset turnover on the basis that firms should perform better with more efficient use of their assets. For this purpose, the total assets turnover ratio (revenue divided by total assets) was used.

3.2.4. One-Year Lag

The impact of female presence on boards is unlikely to have an immediate effect on firm performance, and therefore it is advisable to lag the firm performance measure to the female board participation variable. Thus, Carter et al. (2010) found little difference in the results of a one-year lag and a two-year lag, and therefore used a one-year lag to estimate this effect.

Similarly, in this study, a one-year lagged effect was implemented for the board component. This means that the dependent variable used in year t was combined with the independent variables in year t-1 in the regression models. For example, the firm performance measured in 2019 corresponded to the control variables (including the percentage of women on the board) for 2018. However, due to data constraints, the relationship between female executive management and for performance was only possible for 2019, and hence not lagged.

To some extent this difference in approach can be justified in terms of the different functionality of the board and management within firms. A corporate board's role is to make strategic decisions that likely take longer to translate into changes in firm performance, and

hence a one-year lag makes more sense that a concurrent performance measure. On the other hand, management, including executives, are more responsible for operational and short-term decisions and implementation. These decisions are likely to reflect sooner in firms' performance, reducing the requirement for a lagged approach.

The table below summarises the variables used in the regressions that follow.

Table 3-3: Regression Variables

Variable	**Definition**	**Variable Name used in Regression**
ROA	Return on Assets ratio	ROA
Tobin's Q	Natural logarithm of Tobin's Q ratio	TobinsQ
Female board representation	Percentage of corporate board as women	FemaleBoard
Female executive management representation	Percentage of female as Executives	FemaleExecutives
Firm size	Natural logarithm of Total assets	FirmSize
Board size	Number of Board of Directors/ size of board	BoardSize
Leverage	Debt to equity ratio	Leverage
Asset turnover	Total assets turnover ratio/ total revenue to total assets ratio	AssetsTurnover

3.3 Panel Data Statics Methods

To answer the question of whether there is an association between female board and executive management representation and firm performance, this study makes use of bothunbalanced panel data and non-panel data for female board and managerial impact, respectively.

Depending on the nature of the panel dataset, there are three panel data regression options, namely a pooled OLS regression model, a Fixed Effects (FE) regression model or a Random Effects (RE) regression model. While the analysis for female executive impact utilises the multivariate regression method which will be discussed in the following sections, this section will focus on highlighting the difference between the three potential panel regression methods.

3.3.1 Panel Data

Panel data involves data sets that have both cross-sectional and time-series components (Wooldridge, 2013:448). This means that observations are made on the same unit across a time period. This approach has the advantage of achieving a more accurate estimation of the dependent variable based on the explanatory variables, due to the availability of more degrees

of freedom and greater sample variability (Hsiao, 2007). In addition, panel analysis accounts for the individual-specific effect. Further, Arellano (2003) suggested that the limitation of many non-panel regression models is that they do not consider specific omitted variables. Specifically, these omitted variables may impact the independent variable due to the correlation between the omitted variable and the explanatory variables. Panel regressionmethods attempt to address this problem.

3.3.2 The Pooled OLS Regression Model

Pooled regression implies the pooling of all the observations for each unit across the time period in an ordinary least squares (OLS) regression model, and this regression method is therefore similar to the multivariate linear regression model. When no individual effect is present (i.e. no cross-sectional or time-series effect), pooled regression estimates should be efficient (Greene, 2008: 183; Park, 2011: 7). However, if the regression process involves individual effects, pooled regression may not be the most accurate method to use, due to possible violation of underlying OLS regression assumptions (Park, 2011: 7). Instead, eitherthe Fixed Effects (FE) or the Random Effects (RE) model should be used to address the presence of individual effects.

The major difference between the FE and RE models is the inferences they draw from the data sample. In the case of the FE model, a researcher can draw inference about the group of firms considered in the data sample, whereas a RE model enables the researcher to support inferences about the overall population the sample was drawn from. In addition, an FE modelsupports correlation between the individual effect (in this case, firm-specific effect) of the omitted variables and the independent variables, while RE model assumes otherwise (Greene,2008: 183).

3.3.2.1 Fixed Effects Model

Under the fixed effects model, the slope and error variances of the individual effect are assumed to be constant and considered in the intercept term (Park, 2011: 8). In addition, it isassumed that the individual effects do not change over time and are correlated with the independent variables (Greene, 2008: 193; Park, 2011: 8). With the fixed effects model, onecould draw inferences for the data sample considered, but not for the entire population the sample was drawn from.

3.3.2.2 Random Effects Model

Under the random effects model, the slope and intercept terms are constant, but the error term is randomly distributed (Park, 2011: 8). This is because the individual effect of the omitted variables is assumed to be uncorrelated to the independent variables, which differs from the assumption under the fixed effects model (Greene, 2008: 183). This causes the individual differences to be captured in the error term, instead of in the intercept term. With the random effects model, one could draw inferences for the overall population based on the data sample drawn.

3.4 Model Diagnostic and Selection Testing

In order to efficiently perform regression analyses, it is important to check against the relevant regression assumptions, i.e. the diagnostics of the sample. The relevant diagnostic and model selection tests used to select the most appropriate panel regression models for thisstudy are discussed in this section.

3.4.1 Model Selection Tests

In order to perform panel regression analyses a selection has to be made from three potential models, namely that Pooled OLS regression model, the Fixed Effects model (FE model), and the Random Effects model (RE model). This selection is done on the basis of various statistical diagnostic tests.

3.4.1.1 Lagrange Multiplier (LM) Test

The Lagrange Multiplier test was used to compare the Random Effects models to the Pooled OLS models. The null hypothesis is that the variances of the individual-effect error are zero (Park, 2011: 39). Based on the test results shown in Table A-1 in Appendix A, all the models indicated a rejection of the null hypothesis at a one percent significance level. This means that the Random Effects model is a more appropriate model to use than the OLS model.

3.4.1.2 F-Test

In order to compare the Fixed Effects model to the OLS model, an F-test was used. In this case, the null hypothesis is that the binary variable parameters are zero, i.e. that there are no fixed effects (Park, 2011:33). The test results, presented in Table A-2 of Appendix A, indicated the rejection of the null hypothesis at a one percent significance level. This impliesthat the Fixed Effects model is preferred in comparison to the OLS model.

3.4.1.3 Hausman Test

In order to determine which one of the Fixed Effects and Random Effects models is more appropriate to the dataset, a Hausman specific test was performed. This test has a null hypothesis that the regression errors of independent variables are not correlated with those of the individual-specific effects, i.e., that the Random Effects model is more suitable than the Fixed Effects model (Torres-Reyna, 2007: 29). A statistically significant rejection of the hypothesis would indicate the Fixed Effects model to be more appropriate in this case.

The test results are displayed in Table A-3of Appendix A. In all case the tests failed to reject the null hypothesis at any reasonable level of significance. Therefore, the Random Effects model was the preferred model for regression of the data sample across all the sample countries.

3.4.2 Model Diagnostics

Model diagnostic tests are required to confirm that the data meets the relevant model assumptions, as violations of these assumptions could lead to either Type I or Type II errors, which may reduce the credibility of the regression results (Osborne & Waters, 2002).

3.4.2.1 Multicollinearity

Multicollinearity occurs when independent variables are correlated. This could cause the true impact of independent variables on the dependent variables not to be appropriately reflected by the results of the regression models (Wooldridge, 2009). This requirement was confirmedby checking the correlation coefficients between the independent variables for the data sample separately for each country. The Pearson Correlation Matrices for the independent variables in each country are presented in Chapter 4. Based on the matrices, all correlation coefficients were below eighty five percent, which implies that the risk of negative impact due to multicollinearity on the regression analysis is low. (Schroeder, 1990: 175)

3.4.2.2 Autocorrelation

The Breusch-Godfrey/Wooldridge test was used to investigate the effect of serial correlation (autocorrelation) in the panel models for the female board representation analysis (Breusch, 1978; Godfrey, 1978; Wooldridge, 2002). The null hypothesis is that there is no serial correlation. Based on Table B-1 in Appendix B, all panel models (i.e. Random Effects models) against both independent measures (ROA and Tobin's Q) for each country was found to reject the null hypothesis at a one percent significance level. For female managerial/executive representation impact analysis, because a multiple regression model

was used, the Durbin-Watson test was used to test for serial correlation (autocorrelation). The null hypothesis is that the autocorrelation of the disturbances is zero. Table B-2 presents the test results. The majority of the models were found to reject the null hypothesis at one, five or ten percent significance levels. The US was an exception that failed to reject the null hypothesis. The results imply that autocorrelation may have some impact on the modelling results for both female board and executive representation impact analysis. In order to address this issue, the sandwich estimators of variance (also known as the robust estimator ofvariance) were used when the regression analyses were performed (Hoechle, 2007: 284; Torres-Reyna, 2007: 35). It should be noted that the impact of autocorrelation would only be on the statistical inferences, but that the estimations remain unbiased (Breusch, 1978; Godfrey, 1978; Wooldridge, 2002).

3.4.2.3 Heteroscedasticity

The Breusch-Pagan test was used to test for possible heteroscedasticity in both the panel models and the multiple regression models. The null hypothesis is homoscedasticity, which implies constant variance of the error terms (Torres-Reyna, 2007: 35). The test results are shown in Table B-3 and Table B-4 (Appendix B). The majority of the models were found to reject the null hypothesis and suggest heteroscedasticity in the models. However, Germany was an exception under both the panel models and multiple regression models analysis. The underlying heteroscedasticity may have some impacts on the statistical inferences. Similar to autocorrelation, this issue was addressed with the use of sandwich estimators of variance (Hoechle, 2007: 284; Torres-Reyna, 2007: 35).

3.4.2.4 Normality of residuals

One of the major regression assumptions is the normality of the residuals in the models (Gujarati, 1995: 238). This can be tested through various statistical tests, the best known of which is the Shapiro-Wilk test. The Shapiro-Wilk test was used to investigate the normality of the residuals in the regression models. The null hypothesis is that the residuals are normally distributed. The majority of both the panel models and multiple regression models were found to reject the null hypothesis, although the natural logarithm of Tobin's Q and firmsize variables were taken. This implies that their residuals are not normally distributed (see Table B-5 and Table B-6 in Appendix B).

Although the significance test provides evidence that the residuals may not be normally distributed, one should be aware of the limitation in this test. Field (2013) has argued that it

could be easy to obtain significant results with large sample size when using significance test to check data normality.

In addition, it should be noted that, although the non-normality of the error residuals may affect the estimation and inference of the regression models, the models' unbiasedness (or being selected as the best linear estimator) is not affected (Wooldridge, 2013: 175; Gujarati, 1995; 238). This means that the *t* and *F* distribution for the *t* and *F* statistics may not necessarily be the exact *t* and *F* distributions (Wooldridge, 2013: 168). However, according to the Central Limit Theorem, the *t* and *F* statistics would have approximately *t* and *F* distributions if the size of the data sample is large (Wooldridge, 2013: 168). This (i.e. a largedata sample) is certainly the case in this research, especially for the female board representation analysis.

When interpreting the results based on data in the form of natural logs, it is important to note that one-unit change in the independent variable implies one percentage change in the dependent variable, instead of one absolute unit change (Niap, 2013: 138).

3.5 Regression Procedure and Regression Models

In order to analyse the relationship between female board and managerial representation and firm performance from both the financial and market sentiment perspectives, comprehensive regression procedures were required, as described below.

3.5.1 Regression Procedure for the Female Board Representation Effect

In order to study the relationship between female board representation effect and firm performance, this study used unbalanced panel data and Ordinary Least Squares (OLS) regression techniques. As this analysis considered both time and firm specific factors, panel data methods were used. This is consistent with the paper of Adams and Ferreira (2007) that studied the link between corporate board gender diversity and firm performance for US publicly traded firms from 1996 to 2003.

The two main firm performance measures (dependent variables) were ROA and Tobin's Q, which were used to measure financial performance and market sentiment towards corporates, respectively (Terjesen, Couto & Francisco, 2015; Trinh et.al, 2018). The main independent variable was the percentage of women on corporate board for that specific firm. The control variables included most of the control variables defined, *i.e.* firm size, board size and leverage.

Initially asset turnover was considered as a possible candidate control variable, but it was not selected for use due to two reasons. Firstly, in panel data analysis, the number of years in the test period must be larger than the number of independent variables, including the intercept of regression. In this study, due to the one-year lag used in the regression, the total number of years examined was six years, and the total number of independent variables, including all initial control variables, plus the intercept, was also six. Thus, one of the control variables had to be removed. Secondly, asset turnover is not nearly as commonly supported in the literature as the other three control variables[5]. Thus, asset turnover was discarded as a control variable.

In order to select which one of three potential regressions should be applicable for interpretation, various statistical tests were performed. Firstly, the Lagrange Multiplier test was performed to indicate whether the Random Effects model is the preferred model than the pooled OLS model. Then, an F-test was performed against the pooled OLS regression and theFixed Effect model to confirm the more appropriate model to the dataset. Lastly, a Hausman specific test was performed to choose between the Fixed Effects model and the Random Effects model.

The process of model selection through statistical testing and panel regression modelling was performed for each country's final sample data. The process was performed twice for each country because of the two different dependent variable measures (*i.e.* ROA and Tobin's Q).

For each country, there are three possible modelling options, i.e. the Pooled OLS regression model, the FE model, and the RE model. However, only the most statistically most appropriate model was chosen in each case from among the three potential models, based on the results of the three statistical tests as described above. This implied that for each country there were potentially six regression models (two independent variables, and three panel dataregression options), but only the two statistically appropriate models were selected in each case. As five different countries were examined (China, Japan, the US, the UK and Germany), this implied a total of thirty potential models, from which ten statistically suitablemodels were selected for this study.

The regression models used for each country's final sample data were as shown below.

$$ROA_{it} = \alpha+\beta_1 FemaleBoard_{it-1}+\beta_2 FirmSize_{it-1}+\beta_3 BoardSize_{it-1}+\beta_4 Leverage_{it-1}+ (\varepsilon_{it-1}+u_i) \quad (Eq.\ 1)$$

$$\text{Tobin's } Q_{it} = \alpha+\beta_1 FemaleBoard_{it-1}+\beta_2 FirmSize_{it-1}+ \beta_3 BoardSize_{it-1}+ \beta_4 Leverage_{it-1}+ (\varepsilon_{it-1}+u_i) \quad (Eq.\ 2)$$

[5] Examples include Terjesen, Couto and Francisco (2015), Trinh et.al (2018) and Luo, Xiang and Huang (2017).

Note that the i^{th} firm performance at year t is measured either through ROA or Tobin's Q. α is the intercept. FemaleBoard represents the percentage of corporate board as women. FirmSize and BoardSize measure the size of firm and size of corporate board, respectively. Leverage is the variable that measures the level of leverage of firms. ε_{it-1} is the error term which is independent identically distributed.

It is important to note that, if u_i is defined as the fixed or random effect that is specific to firm or time period, then for pooled OLS regression, α and ε_{it-1} are constant with u_i equals zero. As for Fixed Effects model, α equals the sum of α and u_i with constant ε_{it-1}. In addition, for the Random Effects model, α is constant and ε_{it-1} equals the sum of ε_{it-1} and $u_{i.}$

After running the three potential regression approaches for each independent measure, the three statistical tests required to identify the appropriate regression model were performed inthe sequence LM test, F-test and Hausman test. The outcome of the model selection tests determined the final panel data regression approach chosen to run the regression testing for correlation between female board representation and firm performance.

3.5.2 Regression Procedure for the Female Management Representation Effect

In order to study the relationship between the female representation in firm executive management and firm performance, the study performed a multivariate regression analysis on the variables considered. The required sample data (specifically the percentage of women in firms' executive management) was only available for 2019. A multivariate linear regression was applied for the investigation of observations without time-series component, i.e. the observations are over one-year period (Darmadi, 2020). The variables used were largely as before, namely ROA and Tobin's Q as independent variables, and firm size, leverage and asset turnover as control variables. In this case, however, the independent variable of interest was the percentage of women acting as top executives in a firm. However, as the nature of the data did not require a panel regression approach, assets turnover could in this case be included as a control variable, and the approach used was a multivariate pooled regression.

It was further not possible to lag the female executive representation and the control variables in the regression models to the dependent firm performance measures, given that data on the female executive representation was only available for 2019. Thus, whilst for the board effect regressions the dependent variable was lagged by a year to the independent variables, in the executive management effect regressions all variables were measured concurrently. However, it is argued that this is not entirely unreasonable, as the decisions and actions of top exe:cutive managers may well have a much more immediate impact on firm performance than the strategic

decisions made by board. In the latter case, decisions and actions can be expected to take longer to translate into performance, and hence a lagging approach seems warranted.

The regression models used in this part of the analysis for each country's final sample were:

$$ROA_{it} = \alpha + \beta_1 FemaleExecs_{it-1} + \beta_2 FirmSize_{it-1} + \beta_3 Leverage_{it-1} + \beta_4 AssetsTurnover_{it-1} + \varepsilon_{it-1}$$

(Eq. 3)

$$Tobin's\ Q_{it} = \alpha + \beta_1 FemaleExecs_{it-1} + \beta_2 FirmSize_{it-1} + \beta_3 Leverage_{it-1} + \beta_4 AssetsTurnover_{it-1} + \varepsilon_{it-1}$$

(Eq. 4)

intercept. FemaleExec(utive)s is the variable that measures the percentage of top firm executives that are female. FirmSize and BoardSize represent the size of firm and size of corporate board, respectively. Leverage measures the level of leverage of firms. ε_{it-1} is the error term which is independent identically distributed.

Unlike panel data analysis, there was no requirement for further statistical tests to select the most statistically accurate model to analyse results, and results were solely based on the results obtained from the multivariate pooled regression model formed for each country.

3.5.3 Analysis approach to Investigate Potential Cultural Effects on the Results

Apart from analysing the various regression results to investigate the relationship between female presence on company boards and at firm executive management level, the results also make possible an indirect assessment of differences across countries. In general, a higher estimated coefficient on the female board or management variables would imply a stronger correlation between the relevant female representation measure and corporate performance.

Thus, by comparing these coefficients across the countries covered by this study, some speculative conclusions can be drawn regarding, amongst other things, possible cultural or country specific factors affecting these results. Overall, such an analysis would be worth performing, as it could indicate potential cultural factor influencing the impact of female participation on corporate performance. For example, Srinivas, Allen and Sakamoto (1999) found a favourable attitude towards women in management in the U.S., whereas Japanese male managers indicated that they would be reluctant to work under senior female leaders.

The next chapter discusses and analyses the results of this study.

Chapter 4: Results and Analysis

This chapter discusses and analyses the results obtained using the methodology described inthe previous chapter, starting with a discussion of the descriptive statistics of the various samples and associated data used.

4.1 Descriptive Statistics

Descriptive statistics refers to the summarisation of a set of data in terms of its statistical characteristics. Because this study consisted of two separate components and hence two different samples, the descriptive statistics related to female board representation is discussed first, followed by the descriptive statistics related to female executive representation.

4.1.1 Descriptive Statistic for Female Board Representation

As discussed above, an overview of female board representation across each country is useful in understanding the context of this part of the study.

The table on the next page shows the descriptive statistics of variables involved in the analysis of the correlation between female board representation for the countries examined for the period 2013 to 2019. The variables ROA, FemaleBoard, TobinsQ, Ln (TobinsQ), FirmSize, Ln (FirmSize) and BoardSize are as defined in the previous chapter. However, oneneeds to notice that in the sections other than descriptive statistics, TobinsQ was defined as the natural logarithm of the Tobin's Q. Under descriptive statistics, TobinsQ and Ln (TobinsQ) refer to the original value and the original value converted to its natural logarithm,respectively.

Note that AssetsTurnover is included in the descriptive statistics for a more comprehensive understanding of the sample characteristics, even though this variable was not used in the regression modelling process.

Table 4-1: Descriptive Statistics for Variables used in Female Board Representation Analysis

		ROA	TobinsQ	Ln (TobinsQ)	FemaleBoard	FirmSize	Ln (FirmSize)	BoardSize	Leverage	AssetsTurnover
China	N	1463	1463	1463	1463	1463	1463	1463	1463	1463
	Mean	5.421%	2.183	0.550	10.697%	6.527E+11	24.889	10	1.042	54.652%
	Median	3.270%	1.412	0.345	9.091%	4.855E+10	24.606	9	0.626	44.949%
	SD	6.049%	2.179	0.595	11.396%	2.681E+12	1.832	3	1.213	47.617%
	Min	-19.036%	0.725	-0.322	0.000%	1.295E+09	20.982	1	0.000	2.003%
	Max	46.278%	27.743	3.323	66.667%	2.820E+13	30.970	22	8.223	305.672%
		ROA	**TobinsQ**	**Ln (TobinsQ)**	**FemaleBoard**	**FirmSize**	**Ln (FirmSize)**	**BoardSize**	**Leverage**	**AssetsTurnover**
Japan	N	1269	1269	1269	1269	1269	1269	1269	1269	1269
	Mean	3.410%	1.272	0.181	4.059%	7.379E+12	28.214	11	0.976	76.052%
	Median	3.169%	1.096	0.092	0.000%	1.534E+12	28.059	10	0.588	78.954%
	SD	3.552%	0.542	0.313	5.948%	2.752E+13	1.408	3	1.472	38.653%
	Min	-25.347%	0.624	-0.472	0.000%	1.207E+11	25.517	3	0.000	1.158%
	Max	26.311%	5.298	1.667	42.857%	3.064E+14	33.356	26	15.497	255.892%
		ROA	**TobinsQ**	**Ln (TobinsQ)**	**FemaleBoard**	**FirmSize**	**Ln (FirmSize)**	**BoardSize**	**Leverage**	**AssetsTurnover**
US	N	1153	1153	1153	1153	1153	1153	1153	1153	1153
	Mean	6.162%	2.188	0.634	21.130%	8.032E+10	23.904	11	1.402	66.129%
	Median	5.151%	1.719	0.542	20.000%	2.070E+10	23.753	11	0.794	50.699%
	SD	7.128%	1.430	0.513	9.209%	2.523E+11	1.325	2	3.134	62.004%
	Min	-51.547%	0.643	-0.442	0.000%	8.872E+08	20.604	0	0.000	3.423%
	Max	40.294%	11.402	2.434	62.500%	2.615E+12	28.592	29	51.433	490.197%

		ROA	TobinsQ	Ln (TobinsQ)	FemaleBoard	FirmSize	Ln (FirmSize)	BoardSize	Leverage	AssetsTurnover
UK	N	509	509	509	509	509	509	509	509	509
	Mean	6.403%	1.901	0.452	23.687%	1.224E+11	23.651	11	1.058	70.091%
	Median	5.061%	1.406	0.341	25.000%	1.207E+10	23.214	11	0.629	56.718%
	SD	10.828%	2.615	0.509	9.657%	3.517E+11	1.763	3	1.167	57.968%
	Min	-20.832%	0.688	-0.375	0.000%	7.417E+07	18.122	5	0.000	0.252%
	Max	193.454%	52.908	3.969	72.727%	2.729E+12	28.635	28	7.991	343.616%
		ROA	TobinsQ	Ln (TobinsQ)	FemaleBoard	FirmSize	Ln (FirmSize)	BoardSize	Leverage	AssetsTurnover
Germany	N	173	173	173	173	173	173	173	173	173
	Mean	4.045%	1.503	0.335	24.544%	1.765E+11	24.894	16	1.194	63.640%
	Median	4.053%	1.249	0.222	25.000%	4.565E+10	24.544	18	0.721	60.297%
	SD	3.488%	0.642	0.363	10.860%	3.307E+11	1.363	4	1.615	38.124%
	Min	-7.746%	0.885	-0.123	0.000%	5.112E+09	22.355	4	0.019	0.742%
	Max	11.518%	3.549	1.267	45.454%	1.788E+12	28.212	24	11.482	166.761%

An interesting observation from the above descriptive statistics is the average level of female board representation observed across the samples for the countries examined. On an average level, Japan has the lowest female board representation rate. The Western nations (the US, the UK and Germany) have achieved a comparable level of female board representation on average. However, the level of female representation on corporate boards in the Western nations is nearly double that of Chinese firms and five times that of Japanese corporates.

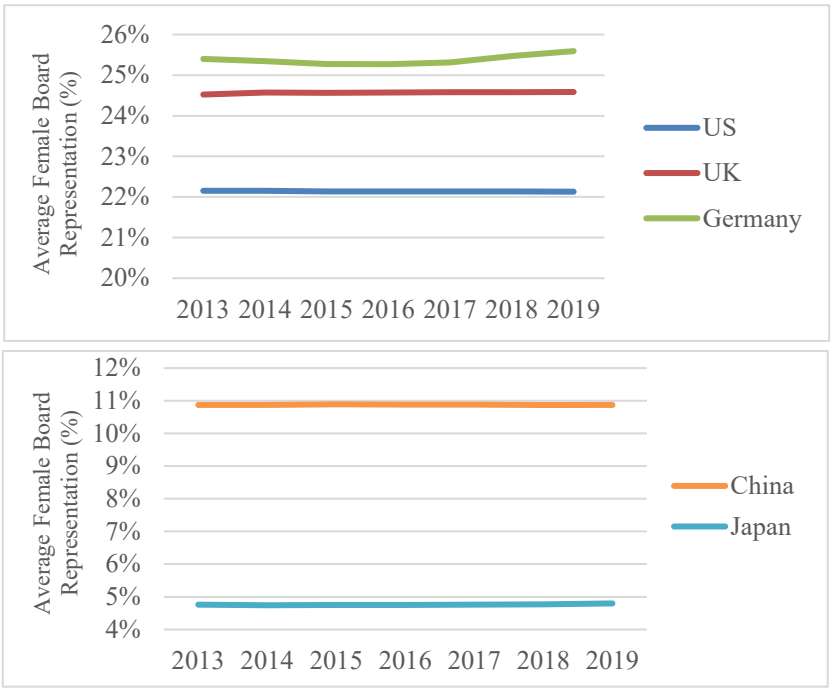
Although the female board presence in China is lower than that of the US and the UK, it is almost double the rate of Japan. Thus, in general, it appears that female board representation is higher on average in the Western countries in this study (*i.e.*, the US, the UK and Germany) when compared to those of the Asian countries (*i.e.*, China and Japan). The most likely reason for this observation is the underlying cultural differences between Eastern and Western societies in terms of the attitude towards women in corporates.

As previously indicated, whilst Western nations focus on gender equality as a fundamental value, Asian countries prefer hierarchy and female modesty in organisations (Datesman, n.d.; Lander, 2016; Bayer, 2018; Bryant, 2019; Evason, 2016). These cultural differences likely affect the ability of women to reach, and play a role at, firms' higher management levels. Thus, for example, according to Dalton's (2013) study, the traditional gender role expectations are still deeply rooted in Japanese society, including that women should be primarily responsible for homes and contribute to motherhood, although they may have potential for career advancements and serve positions in corporates, or even the government.

Based on the respective country averages, the sizes of corporate boards seem similar across various regions (generally around 11 people), except for Germany, which has slightly larger boards (i.e. 16 board directors on average) than the other countries examined. From the leverage perspective, on average, US corporates display the highest level of leverage amongst the countries examined (1.402 times), and Japanese ones the lowest (0.976 times). In general, the leverage level of Western firms (*i.e.* the US, the UK and Germany) is higher than that of the Asian corporates (*i.e.* China and Japan). A partial explanation may again be in terms of potential cultural differences, as Asian cultures are more risk-averse than the Western ones.

In terms of efficiency as indicated by asset turnover, Japanese firms were the most efficient in the sample, and Chinese firms the least benefit from their assets. An interesting analysis is that of female board presence across the five countries investigated over the test period. The graph below depicts the yearly female board representation rate for each country from 2013 to 2019.

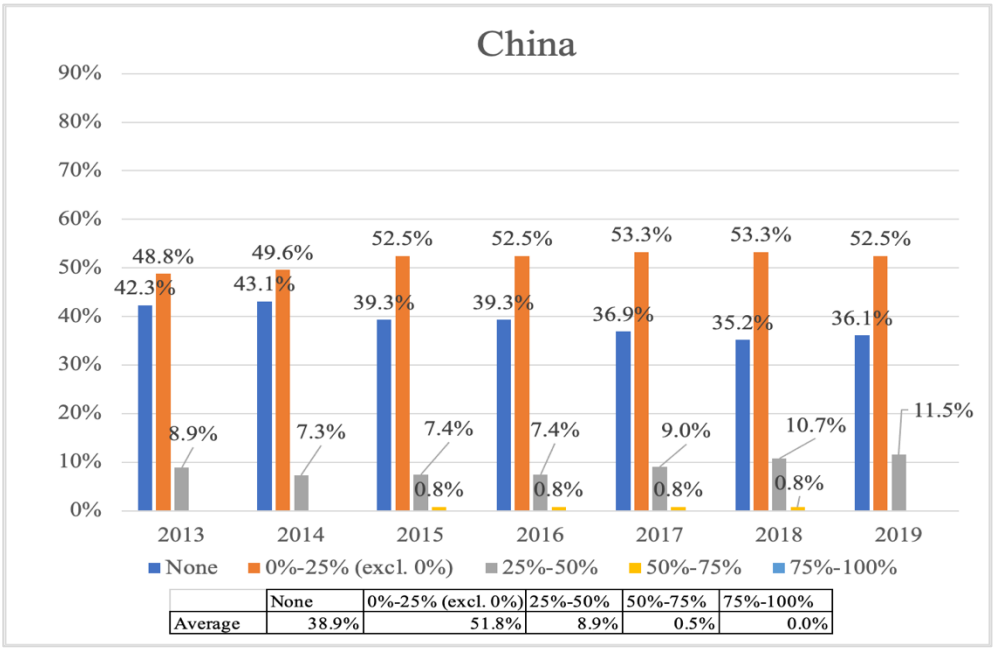
Table 4-2: Average Female Board Representation Yearly Trend



The graph above shows an overall flat trend over time across the countries examined. Over the seven years of the test period (*i.e.*, 2013-2019), the presence of women on companyboards in all five countries seems to have stagnated, with only Germany perhaps displaying aslight increase in its female board representation level between 2018 and 2019.

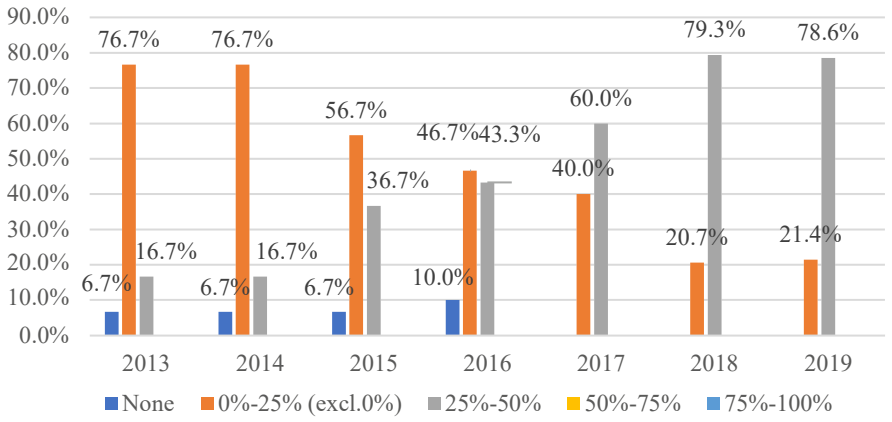
It is further interesting to analyse the distribution of female board presence amongst corporates in each country sample over the period. The table below depicts the proportion offirms with specific female board representation across the countries examined for the period2013 to 2019.

Table 4-3: Distribution for female board representation from 2013 to 2019



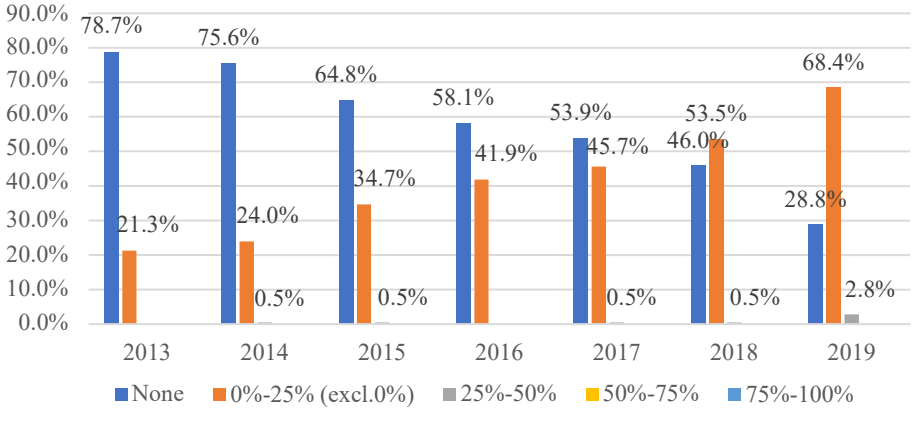
	None	0%-25% (excl. 0%)	25%-50%	50%-75%	75%-100%
Average	38.9%	51.8%	8.9%	0.5%	0.0%

Germany



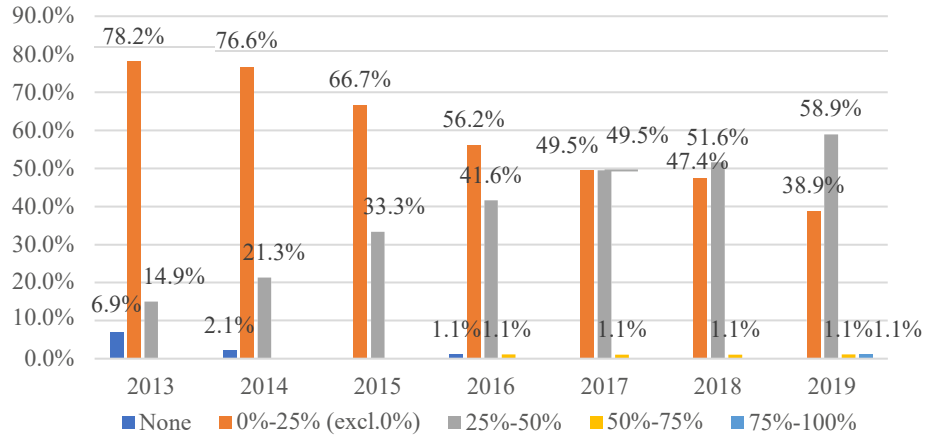
	None	0%-25% (excl.0%)	25%-50%	50%-75%	75%-100%
Average	4.3%	48.4%	47.3%	0.0%	0.0%

Japan



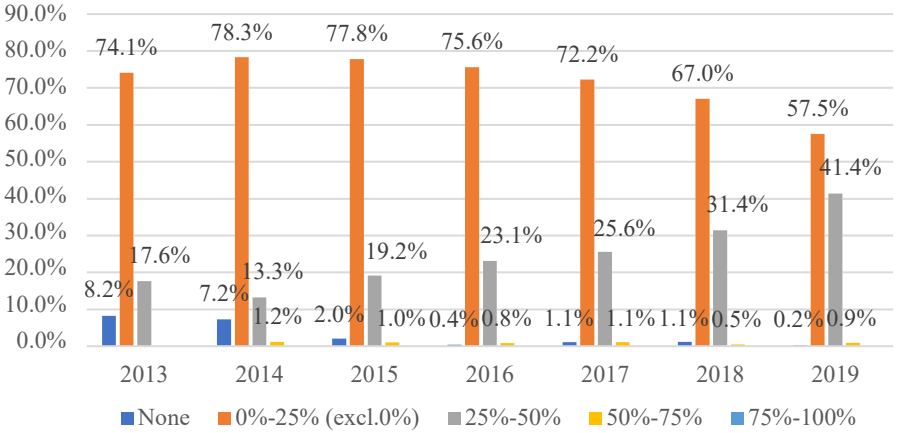
	None	0%-25% (excl.0%)	25%-50%	50%-75%	75%-100%
Average	58.0%	41.3%	0.7%	0.0%	0.0%

UK



	None	0%-25% (excl.0%)	25%-50%	50%-75%	75%-100%
Average	7.0%	61.9%	30.5%	0.6%	0.0%

US



	None	0%-25% (excl.0%)	25%-50%	50%-75%	75%-100%
Average	2.9%	71.8%	24.5%	0.8%	0.0%

An interesting observation from the above table is that, on average, 47.3% of German corporates in the sample have achieved greater than 25% female board representation over the entire period, which is the highest amongst the countries examined. It is also noticeablethat there is an upward trend in female board representation, which could be linked to the introduction of gender quota legislation, as mentioned earlier.

In the US and the UK, over the sample period, the average percentage of companies with boards consisting of more than 25% women was, 25.3% and 32.2%, respectively. In both countries, for the sample at least, the trend is again slowly upward. When it comes to the twoAsian countries, however, the picture is very different. On average, only 9.4% of Chinese firms have more 25% of board their boards consisting of women, although the trend is slightly upward. At the low extreme is the Japan sample, with only 0.7% of company years showing a female board presence of more than, Thus, over the period, more than 58% of company years indicated no female board presence at all.

In general, the overall trend of female's board representation reflects a steady but flat outlook over the period across all five countries examined.

4.1.2 Descriptive Statistics for Female Executive Representation

The sample used to study the link between female representation in senior managerial positions consisted of the same countries as the first (board) part of the study, but due to constraints imposed by a lack of data availability covered only one year (2019), instead of seven years. Therefore, the sample and the associated variables differ from that described above. This is specifically applicable to Germany, as the number of observations of Germancompanies was only 28 in 2019 due to lack of data. This could impose a limitation towards finding in German corporates.

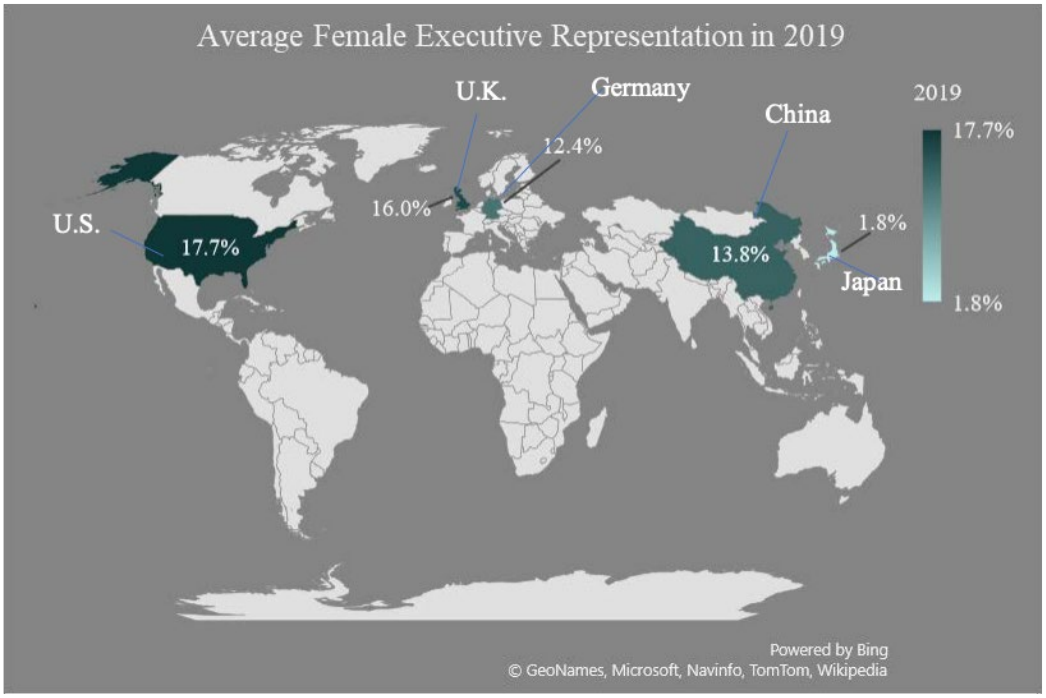
The table on the next page displays the descriptive statistics of variables involved in the female executive presence analysis for each country examined. FemaleExecutives denotes the percentage of women at top executives' level, and the remainder of the variables are defined the same way as before.

Table 4-4: Descriptive Statistic of Variables for Female Executive Representation Analysis

		ROA	TobinsQ	Ln (TobinsQ)	FemaleExecutives	Firm Size	Ln (FirmSize)	Leverage	AssetsTurnover
China	N	299	299	299	299	299	299	299	299
	Mean	5.752%	2.205	0.527	13.834%	7.636E+11	25.240	1.036	55.048%
	Median	3.256%	1.285	0.251	12.500%	6.769E+10	24.938	0.654	48.002%
	SD	6.140%	2.177	0.643	14.355%	3.165E+12	1.756	1.121	47.095%
	Min	-4.200%	0.725	-0.322	0.000%	4.686E+09	22.268	0.000	2.470%
	Max	34.847%	15.544	2.744	66.667%	3.043E+13	31.046	5.387	326.365%
		ROA	**TobinsQ**	**Ln (TobinsQ)**	**FemaleExecutives**	**Firm Size**	**Ln (FirmSize)**	**Leverage**	**AssetsTurnover**
Japan	N	217	217	217	217	217	217	217	217
	Mean	3.566%	1.317	0.178	1.835%	9.486E+12	28.356	0.906	73.049%
	Median	3.072%	1.058	0.057	0.000%	1.780E+12	28.208	0.505	77.902%
	SD	3.195%	0.852	0.379	4.375%	3.534E+13	1.457	1.438	37.337%
	Min	-7.217%	0.624	-0.472	0.000%	7.310E+10	25.015	0.000	1.033%
	Max	17.457%	9.323	2.232	40.000%	3.130E+14	33.377	14.569	201.716%
		ROA	**TobinsQ**	**Ln (TobinsQ)**	**FemaleExecutives**	**Firm Size**	**Ln (FirmSize)**	**Leverage**	**AssetsTurnover**
US	N	480	480	480	480	480	480	480	480
	Mean	6.619%	2.183	0.632	18.824%	9.484E+10	24.159	3.076	63.043%
	Median	5.351%	1.682	0.520	18.182%	2.670E+10	24.008	0.998	49.083%
	SD	6.266%	1.476	0.511	13.018%	2.798E+11	1.325	15.588	56.400%
	Min	-15.514%	0.851	-0.162	0.000%	1.750E+09	21.283	0.018	3.634%
	Max	28.840%	13.772	2.623	66.667%	2.760E+12	28.646	215.250	376.891%

		ROA	TobinsQ	Ln (TobinsQ)	FemaleExecutives	Firm Size	Ln (FirmSize)	Leverage	AssetsTurnover
UK	N	95	95	95	95	95	95	95	95
	Mean	8.423%	2.456	0.503	16.292%	1.132E+11	23.594	1.132	65.735%
	Median	5.093%	1.380	0.322	13.333%	1.230E+10	23.233	0.755	52.345%
	SD	20.968%	5.480	0.645	13.309%	3.418E+11	1.802	1.496	52.707%
	Min	-13.733%	0.747	-0.291	0.000%	1.000E+08	18.421	0.000	0.238%
	Max	193.454%	52.908	3.969	50.000%	2.730E+12	28.635	12.444	280.085%
		ROA	TobinsQ	Ln (TobinsQ)	FemaleExecutives	Firm Size	Ln (FirmSize)	Leverage	AssetsTurnover
Germany	N	28	28	28	28	28	28	28	28
	Mean	4.089%	1.507	0.325	12.795%	1.851E+11	25.022	0.974	53.097%
	Median	3.202%	1.222	0.200	14.286%	5.674E+10	24.760	0.767	51.643%
	SD	3.270%	0.729	0.393	8.627%	3.292E+11	1.335	0.780	32.848%
	Min	-0.967%	0.929	-0.074	0.000%	7.002E+09	22.669	0.053	1.836%
	Max	10.755%	3.382	1.219	25.000%	1.501E+12	28.037	3.317	124.869%

Below is another graphic representation that depicts the average female executive representation in 2019 for each country examined.



Based on the average level of female executive representation for the sample in 2019, the US component has the highest female top executive representation rate of 18.8%, followed by the UK at 16.3%. At 13.8%, China has a slightly higher level of female executive representation than that of Germany (12.3%). Consistent with the corporate board picture, Japan again ranks significantly lower than any of the other countries, with a figure of 1.8%. This could be due to the unfavourable attitude towards women in senior leadership positions within Japanese organisation, as led by the Japanese cultural values. A 2016 national survey in Japan still showed that more than 40% of men and more than 35% of women believe in the gendered division of labour (Kano, 2018). Lebra (2007) also suggested that there exists an "M" shaped curve to represent the general trend of Japanese women's career path, where they are expected to leave their career and opt for motherhood rather than career advancement at a certain point. This is because family responsibility usually takes priority over employment for women in Japan. This could be a reflection of the widespread view in Japan that the priority of women should be family responsibility, rather than career progress.

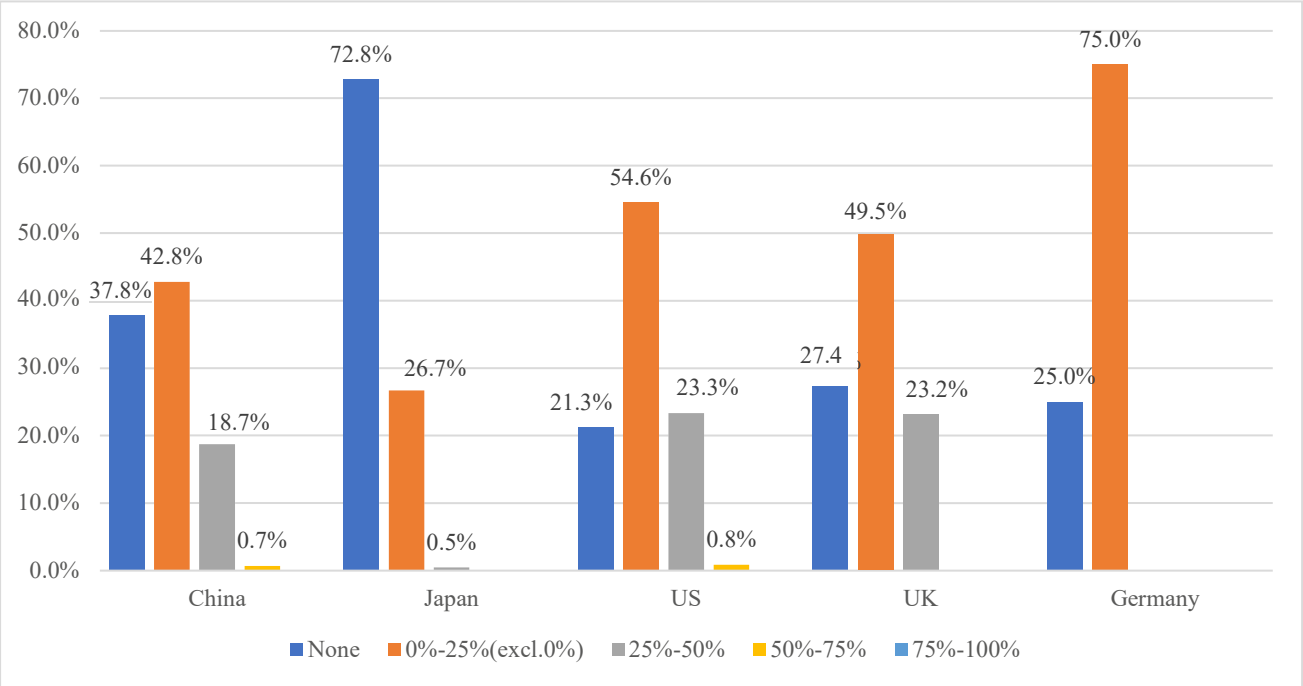
The maximum level of female executive representation achieved is about the same for China and the US, both being the highest in the combined sample. In addition, Japanhas a comparable level of maximum female executive presence to that of the UK.

Another interesting observation is that during 2019, UK corporates on an average displayed the highest financial performance in terms of ROA level, while those of Japan did the worst. Financial performance of Chinese corporates is comparable to those of the US, but higher than the German firms considered. From a market sentiment perspective (Tobin's Q), on average level, the sentiment is favourable towards the UK market indicated by the highest Tobin's Q value, which could be justified by its highest financial performance. However, themarket sentiment towards the Chinese and the US market is comparable, with Japanese market has the lowest market valuation.

Similarly, to the board representation sample, US corporates again display the highest level of leverage, and Japanese firms the lowest. Also, as before, Western companies (specifically those of the UK and the US) are in general higher leveraged than the Asian companies in the sample. For this (2019 only) sample, German firms display a similar level of leverage to Japanese. As indicated before, one factor that could play a role here are cultural attitudes towards risk.

The distribution of the female executive presence amongst the sample corporates by country in 2019 is shown below.

Table 4-5: Distribution for Female Executive Representation in 2019



As can be seen, in 2019 around a quarter of US and UK firms had top management teams consisting of 25% or more women. At around 19%, China was only slightly lower in this regard. At the other extreme, practically all the companies in the German and Japanese samples had a female executive presence of less than 25% at the senior management level. A full 72.8% of the Japanese firms in the sample had zero female executives. Interestingly, the proportion of Chinese firms with female executives is comparable, albeit slightly lower, to that of the US or the UK in most ranges (*i.e.* 0%-25%, 25%-50% and 50%-75%), but with a higher proportion of firms having zero female top executives than for the three Western nations.

In general, the overall level of female senior executive presence in the corporates of the three Western countries seem to be higher than that of the Asian countries, consistent with the observations at board level. The reasons may again include cultural differences in the attitude towards women in the workplace.

4.2 Pearson Correlation

A useful measure to help the researcher establish an initial understanding of the relationship between the variables in an analysis is correlation analysis. A Pearson Correlation Matrix, as a power correlation analysis method, may provide useful insights based on the strength and direction of the linear relationship between variables. This analysis enables the researcher to understand any potential correlation that exist amongst the variables. The following sections discuss the correlation results for the female board and management representation sections of the study, respectively.

4.2.1 Correlation Matrix for Female Board Representation Analysis

The table below shows the correlations between the variables considered in the first part ofthe study.

Table 4-6: Pearson Correlation Matrix (Variables in the Female Board Presence Analysis)

		FemaleBoard	FirmSize	BoardSize	Leverage	ROA	Tobin's Q
China	FemaleBoard	1.000	-0.058	0.006	0.007	0.095	0.096
	FirmSize	-0.058	1.000	0.430	0.646	-0.465	-0.709
	BoardSize	0.006	0.430	1.000	0.387	-0.234	-0.252
	Leverage	0.007	0.646	0.387	1.000	-0.425	-0.491
	ROA	0.095	-0.465	-0.234	-0.425	1.000	0.663
	Tobin's Q	0.096	-0.709	-0.252	-0.491	0.663	1.000

Japan		FemaleBoard	FirmSize	BoardSize	Leverage	ROA	Tobin's Q
	FemaleBoard	1.000	0.283	0.045	0.097	-0.016	0.037
	FirmSize	0.283	1.000	0.295	0.382	-0.223	-0.271
	BoardSize	0.045	0.295	1.000	0.053	-0.047	-0.073
	Leverage	0.097	0.382	0.053	1.000	-0.283	-0.223
	ROA	-0.016	-0.223	-0.047	-0.283	1.000	0.547
	Tobin's Q	0.037	-0.271	-0.073	-0.223	0.547	1.000
US		FemaleBoard	FirmSize	BoardSize	Leverage	ROA	TobinsQ
	FemaleBoard	1.000	0.186	0.066	0.055	0.073	0.034
	FirmSize	0.186	1.000	0.428	0.039	-0.306	-0.481
	BoardSize	0.066	0.428	1.000	0.040	-0.136	-0.174
	Leverage	0.055	0.039	0.040	1.000	0.014	0.031
	ROA	0.073	-0.306	-0.136	0.014	1.000	0.620
	Tobin's Q	0.034	-0.481	-0.174	0.031	0.620	1.000
UK		FemaleBoard	FirmSize	BoardSize	Leverage	ROA	Tobin's Q
	FemaleBoard	1.000	0.073	0.096	0.130	0.120	0.135
	FirmSize	0.073	1.000	0.530	0.251	-0.389	-0.577
	BoardSize	0.096	0.530	1.000	0.109	-0.167	-0.196
	Leverage	0.130	0.251	0.109	1.000	-0.020	0.053
	ROA	0.120	-0.389	-0.167	-0.020	1.000	0.569
	Tobin's Q	0.135	-0.577	-0.196	0.053	0.569	1.000
Germany		FemaleBoard	FirmSize	BoardSize	Leverage	ROA	Tobin's Q
	FemaleBoard	1.000	0.213	0.161	-0.014	0.037	0.025
	FirmSize	0.213	1.000	0.414	0.454	-0.615	-0.670
	BoardSize	0.161	0.414	1.000	0.295	-0.175	-0.218
	Leverage	-0.014	0.454	0.295	1.000	-0.385	-0.357
	ROA	0.037	-0.615	-0.175	-0.385	1.000	0.739
	Tobin's Q	0.025	-0.670	-0.218	-0.357	0.739	1.000

The above correlation matrix reveals that the variable of interest, FemaleBoard (i.e. the percentage of women on the board), displays a positive but limited association with firm financial performance (ROA) and the market valuation of assets (Tobin's Q) for most countries. This indicates that there may be a positive relationship between female board representation and firm performance in a manner, but that the relationship is fairly weak. This trend was discovered for nearly all of the countries examined, except for Japan. The association between female board representation and firm financial performance in Japan is negative and weak, implying that a higher number of women on company boards affect the

profitability of Japanese corporates negatively, but in a very limited way. Of the countries examined, female board presence seems to have the strongest positive relationship with the profitability and market perception in the case of UK corporates, and less so for China, the US and Germany. In general, though, the relationship between the level of female board presence and firm performance appears fairly weak for all five countries over the sample period. This finding is consistent with the findings of previous researchers, such as Erhardt, Werbel and Shrader (2003), Terjesen, Couto and Francisco (2015), and Trinh et.al (2018), who all found fairly weak positive relationships between female board presence and firm performance.

Another interesting observation is the stronger but negative relationship that exists between most of the control variables and firm performance measures across all five countries. Firm size is found to have a strongly negative relationship with both ROA and Tobin's Q in all cases, indicating that small firm generally outperform larger ones. This trend is especially true for firms in China, Germany and the UK. This negative association (albeit quite weak) was also previously found in the three studies mentioned above. The table also indicates a negative association between the firm performance measures. On the one hand, and the size of the board and levels of leverage on the other, for most of the countries examined. This was consistent with findings by Erhardt, Werbel and Shrader (2003), and Terjesen, Couto and Francisco (2015), although weaker than that in this study. The exception in this study was the US, where a positive association between leverage and firm performance was found, which is consistent with the findings of Trinh et.al (2018), both in terms of sign and strength.

4.2.2 Correlation Matrix for Female Executive Representation Analysis

The Pearson Correlation Matrix correlation between the variables involved in the female executive representation analysis is shown in the table below.

Table 4-7: Pearson Correlation Matrix (Variables in Female Executive Presence Analysis)

		FemaleExecutives	FirmSize	Leverage	AssetsTurnover	ROA	Tobin's Q
China	FemaleExecutives	1.000	-0.271	-0.097	0.014	0.183	0.250
	FirmSize	-0.271	1.000	0.665	-0.310	-0.524	-0.662
	Leverage	-0.097	0.665	1.000	-0.415	-0.510	-0.513
	AssetsTurnover	0.014	-0.310	-0.415	1.000	0.323	0.262
	ROA	0.183	-0.524	-0.510	0.323	1.000	0.781
	Tobin's Q	0.250	-0.662	-0.513	0.262	0.781	1.000

Japan		FemaleExecutives	FirmSize	Leverage.	AssetsTurnover	ROA	Tobin's Q
	FemaleExecutives	1.000	0.207	0.163	-0.124	0.038	0.132
	FirmSize	0.207	1.000	0.386	-0.503	-0.291	-0.268
	Leverage	0.163	0.386	1.000	-0.373	-0.344	-0.212
	AssetsTurnover	-0.124	-0.503	-0.373	1.000	0.225	0.148
	ROA	0.038	-0.291	-0.344	0.225	1.000	0.658
	Tobin's Q	0.132	-0.268	-0.212	0.148	0.658	1.000
US		FemaleExecutives	FirmSize	Leverage.	AssetsTurnover	ROA	Tobin's Q
	FemaleExecutives	1.000	0.204	0.057	0.061	0.013	-0.018
	FirmSize	0.204	1.000	-0.014	-0.279	-0.408	-0.534
	Leverage	0.057	-0.014	1.000	0.076	0.024	0.034
	AssetsTurnover	0.061	-0.279	0.076	1.000	0.266	0.282
	ROA	0.013	-0.408	0.024	0.266	1.000	0.746
	Tobin's Q	-0.018	-0.534	0.034	0.282	0.746	1.000
UK		FemaleExecutives	FirmSize	Leverage.	AssetsTurnover	ROA	Tobin's Q
	FemaleExecutives	1.000	-0.018	0.335	0.087	0.295	0.213
	FirmSize	-0.018	1.000	0.041	-0.409	-0.428	-0.677
	Leverage	0.335	0.041	1.000	0.012	-0.011	0.115
	AssetsTurnover	0.087	-0.409	0.012	1.000	0.418	0.441
	ROA	0.295	-0.428	-0.011	0.418	1.000	0.671
	Tobin's Q	0.213	-0.677	0.115	0.441	0.671	1.000
Germany		FemaleExecutives	FirmSize	Leverage.	AssetsTurnover	ROA	Tobin's Q
	FemaleExecutives	1.000	0.152	0.097	-0.088	0.179	0.191
	FirmSize	0.152	1.000	0.555	-0.536	-0.675	-0.665
	Leverage	0.097	0.555	1.000	-0.165	-0.444	-0.394
	AssetsTurnover	-0.088	-0.536	-0.165	1.000	0.564	0.360
	ROA	0.179	-0.675	-0.444	0.564	1.000	0.751
	Tobin's Q	0.191	-0.665	-0.394	0.360	0.751	1.000

In contrast to the female board presence measures discussed above, the percentage of women as top executives in firms have a relatively strong and positive relationship with ROA and Tobin's Q for most of the countries in question. UK, German and Chinese firms' profitability levels seem to have the strongest association with this variable. However, US firms display a negative and weak relationship between the level of female executives and market valuation as measured by Tobin's Q. This could be an indication that in the US, where female executive leadership is well established, the market does not attach as much importance to this factor compared to elsewhere.

A similar result is found for the control variables as previously, namely a strongly negative association between firm size and firm performances measures (ROA and Tobin's Q) across all countries. This is especially applicable to Germany and China. The level of leverage seems to have a relatively weaker but negative relationship with firm performance for the majority of the countries, except for the US and the UK, where this variable displays a positive relationship with ROA (both), and Tobin's Q (the US only). Additionally, Assets Turnover has a relatively stronger positive impact on ROA and Tobin's Q across all countries, hence justifying its inclusion in the regression model for this section of the study.

4.3 Regression Results

In order to comprehensively investigate the relationship between female representation on board and executive levels and firm financial and market performance, the methodology described in Chapter 3 was followed. This included the construction and testing of various regression models in order to test the validity of the hypotheses set out at the start of this study. The regression results for the relationship between female board and executive representation and firm performance is presented and discussed separately in detail in the sections that follow.

4.3.1 Regression Results for Female Board Representation Effect

Previous literature[6] motivated the importance of female board representation for corporates and emphasised the positive impact on firm performance linked to increased female board representation. In order to investigate the impact effectively, the most statistically accurate model was selected. As discussed in Chapter 3, for all five country data sets, the Random Effects Model was found to be the most appropriate model for statistically testing the relationship between female board representation and firm performance.

The table below displays the Random Effect regression modelling results for each variable involved in the female board representation effect analysis. As a reminder, FemaleBoard denotes the percentage of women on corporate board, Ln (FirmSize) measures the firm sizeas log of total assets, BoardSize is the number of people on a specific corporate board, and Leverage is measured as the firm's debt to equity ratio.

[6] Examples include studies performed by Erhardt, Werbel and Shrader (2003), Trinh et.al (2018), Reinert, Weigert and Winnefeld (2016), and Dezső and Ross (2008)

Table 4-8: Regression Results for the Female Board Representation Effect.

	Dependent Variable: ROA				
	China	Japan	US	UK	Germany
Female presence on board	0.005	0.028	0.079***	0.099	0.026
	(-0.248)	*(-1.101)*	*(-1.994)*	*(-1.186)*	*(-1.115)*
Firm Size	-0.017***	-0.005***	-0.021***	-0.040***	-0.019***
	(-8.452)	*(-3.852)*	*(-9.729)*	*(-4.816)*	*(-5.350)*
Board Size	0.000	0.000	0.000	-0.001	0.002**
	(-0.153)	*-0.131*	*-0.3806*	*(-0.336)*	*-1.828*
Leverage	-0.003	-0.005***	0.001**	0.008	0.000
	(-1.024)	*(-2.488)*	*(-1.7712)*	*(-1.245)*	*(-0.193)*
Adjusted R-squared	0.225	0.093	0.105	0.162	0.374

	Dependent Variable: Tobin's Q				
	China	Japan	US	UK	Germany
Female board presence	0.053	0.055	0.095	0.152	-0.111
	(-0.306)	*(-0.156)*	*(-0.334)*	*(-0.33)*	*(-0.370)*
Firm Size	-0.265***	-0.090***	-0.197***	-0.242**	-0.197***
	(-10.317)	*(-6.753)*	*(-11.503)*	*(-9.161)*	*(-4.208)*
Board Size	0.003	0.003	0.002	0.009	0.022***
	(-0.448)	*(-0.526)*	*(-0.169)*	*(-0.505)*	*(-2.108)*
Leverage	0.012	0.008	0.003	0.031	0.006
	(-0.422)	*(-1.009)*	*(-0.646)*	*(-0.915)*	*(-0.37)*
Adjusted R-squared	0.502	0.065	0.234	0.361	0.393

Note: Heteroscedastic robust z statistics in parentheses. *, ** and *** refer to significance at the 10%, 5% and 1% levels, respectively.

At a high level, the results using the Random Effects models are consistent in sign with the results from the majority of past literature, but unlike the latter, not statistically significant for female board representation (FemaleBoard) for most of the countries examined, even at the 10% level of statistical significance, regardless of the firm performance indicator (ROA or Tobin's Q). However, with regards to ROA, the US appears to be the exception as the positive correlation of female board representation with the financial performance of American firms was found to be statistically significant at the 1% level of statistical significance. Reasons for the (generally) different result to many prior findings in terms of statistical significance could be due to the sample period in this study being different to those used in most past studies, which often consist of only one year, or included an earlier period than used for this study. For example, the study done by Terjesen, Couto and Francisco (2015) only covered 2010, that of Dezső and Ross (2008), used 1992 to 2006 as sample period, and Erhardt, Werbel and Shrader (2003) studied the period 1993 to 1998. A second possible reason for many published studies reporting results with a stronger statistical significance may relate to the methodology

used. Thus, it appears that several studies did not apply panel regressions, despite the panel nature of data sets used. For example, Rose (2007)used a cross-sectional regression analysis on a data set spanning 1998 to 2001. The last possible cause of the different result could be a selection bias, in that only studies finding statistically significant relationships between female board and senior management representation and firm performances end up being published in the literature.

In all cases, except for the model linking female board representation in Germany to Tobin's Q, the coefficient of FemaleBoard is positive, implying that higher female board representation is potentially beneficial to firms' financial performance level. The magnitude of the implied impact on corporate financial performances differ between the countries, ranging from around 0.5% on ROA in China to nearly 10% on ROA in the UK.

On the other hand, when the model is measured against the market sentiment indicator, *i.e.* Tobin's Q, there is a positive correlation from having higher percentage of women on corporate boards for all the countries except for Germany. Again, the strongest positive association is found in the UK, and the weakest positive associations for China and Japan. However, for Germany the association is negative, implying a negative market perception of women on company boards.

As indicated above, the highest impact from female board representation on firm performance appears to be in the UK and the US. This could in part result from the fact that the UK and US samples have the highest female board representation level among all countries examined. Thus, as per Table 4-2, there was a great improvement in female board representation in the US and the UK between 2013 and 2019, with an increasing number offirms having female board representation levels of 25%-50%, and even 50%-75%. This is significantly higher than the upper limit ten to twenty years ago (Flynn & Adams, 2004; Singh et al., 2001). It is possible that a critical level of female board representation is requiredbefore women have a significant impact on company performance, or the market's perceptions of the value of the firm. In general, the apparent correlation between the different prevalence of female board representation cross the five countries and the different impact ofthis representation on company performance measures in different countries could also be indicative of cultural effects that possibly limit women's ability to influence company decisions to different extent in the various countries.

Similarly, the weaker association between female board presence and corporate performance for Chinese and Japanese corporates is in the context of a lower level of female board representation level compared to the Western countries. Thus, Lam, McGuinnes and Vieito

(2012) indicated that only 4.4% of Chinese firms were led by female CEOs. Another survey, performed by Terjesan and Singh (2008), also confirmed only 2% female presence on Japanese corporate boards. Again, cultural effects and a lack of critical mass within boards may limit women's' ability to impact company performance.

In general, the positive relationship between female board presence and firm performance is stronger for the US and UK, compared to Germany and the Asian countries. As previously discussed, this could be due to underlying cultural differences in how women are perceived in different business environments.

It is important to note that, except for the US in terms of ROA, none of the coefficients on the measures of female board representation with regards to firm financial or market performance was found to be statistically significant, even at a 10% significance level. However, the positive association found throughout is consistent with many previous studies,[7] in which researchers found a positive relationship between female board presence and firm performance. For example, Erhardt, Werbel and Shrader (2003) found a positive underlying relationship between gender-diversity on corporate boards and corporate financial performance for American corporates for a sample covering 1993 to 1998. Trinh et al. (2018) also found strong evidence in support of a positive impact of women on UK firm performance. Similar evidence[8] was also discovered in the Asian countries by previous researchers. However, although a similar association was found in this study, the association was weak, and majority were not statistically significant. As indicated above, this different result could be due to a different sample and sample period, the use of a different methodology (panel regressions), or a selection bias in the publication of work in this field. The results of this study (particularly in terms of statistical significance) potentially questionssome of the previous findings and emphasises the need for further investigation of this topic.

With regards to the control variables, firm size seems to have negative impact on corporate performance across the countries examined, as the greater the firm size, the lower both the financial and market performance (respectively measured as ROA and Tobin's Q) in all cases. This is consistent with most of the literature. Thus, for example, Moreno-Gomez, Lafuente and Vaillant (2017) found a negative relationship between firm size and firm financial performance measures using panel regression techniques. However, Terjesen, Couto and Francisco (2015) found a weak positive association between firm size and firm performance.

[7] Examples include studies performed by Erhardt, Werbel and Shrader (2003), Trinh et.al (2018), Reinert, Weigert and Winnefeld (2016), and Dezső and Ross (2008).
[8] Luo, Xiang and Huang (2017), and Nakagawa and Schreiber (2014)

Darmadi (2010), on the other hand, found a statistically significantly positive association between firm size and ROA, but a negative, non-significant association between firm size and Tobin's Q. The majority of past studies do, however, find a positive relationshipbetween firm size and firm performance[9].

In addition, although the financial performance of firms in UK seem to experience a slight negative effect from having a larger board for firm performance (ROA) only, all other country-specific models show a positive association between financial and market performance and board size. This variable was found to be statistically significant for firms inGermany at 5% and 1% for ROA and Tobin's Q measurement respectively, but not for any ofthe other eight country-specific models. This positive but mostly insignificant association wasfound in line with some previous findings by past researchers (Erhardt, Werbel & Shrader, 2003; Moreno-Gomez, Lafuente & Vaillant, 2017; Darmadi, 2010). However, Terjesen, Couto and Francisco (2015) also found evidence that board size may negatively affect marketsentiment towards corporates (*i.e.* measured by Tobin's Q) and this relationship was found to be statistically significant. But one should note that their study used a single year as test period, which differs from most studies.

Leverage seems to have slight positive impact on financial performance of firms in the US, the UK and Germany, but the opposite for China and Japan. However, in terms of the market sentiment (Tobin's Q), leverage is positively associated with market valuation in all cases.

This variable was found to be statistically significant under financial performance measurement (ROA) for firms in Japan and US at 1% and 5% significance level respectively, but not for any of the other country-specific models. This contrasts with the previous findings. For example, Moreno-Gomez, Lafuente and Vaillant (2017) has found a negatively insignificant relationship between leverage and ROA. The different time period (*i.e.*2008-2015) and data set (*i.e.* Colombian public companies) may drive the difference in findings. Terjesen, Couto and Francisco (2015) also provided evidence the negative and significant association between leverage and ROA, although the insignificant positive association between leverage and Tobin's Q was in line with the study.

4.3.2 Regression Results for Female Executive Representation Effect

The results of the regression models were tested to investigate whether female representation at senior management level (*i.e.* top executives) is positively correlated with firm financial performance and/or market perception across the five study countries is reported and discussed

[9] Examples include Rose (2007), Moreno-Gomez, Lafuente and Vaillant (2017), and Erhardt, Werbel and Shrader (2003).

in the section that follows. This expands the concept of female impact on firm performance beyond the board level, which has been the focus of the vast majority of past studies in this area. The consideration of a female top managerial effect may therefore add new insights to the discussion of potential female impact on firm performance. As indicated in the previous chapter, female executive data was only available for the year 2019, resultingin multivariate regression models being used for this part of the study. One should specifically notice that Germany only had 28 observations in 2019 due to the data constraint,which could impose some limitations on its findings.

The table below displays the multivariate regression modelling results for each variable involved in the female executive (managerial) representation effect analysis. In this case, FemaleExecutives denotes the percentage of women acting as top executives in corporates. As before, Ln (FirmSize) is the natural logarithm of total firm assets, and Leverage and asset turnover were measured through the debt to equity ratio and assets turnover ratio of each firm, respectively.

Table 4-9: Regression Results for Female Executive Representation Effect.

Dependent Variable: ROA					
	China	Japan	US	UK	Germany
Female presence as Executives	0.033	0.093	0.043**	0.474	0.111***
	(1.544)	*(1.501)*	*(1.958)*	*(1.640)*	*(-2.238)*
Firm Size	-0.010***	-0.004***	-0.020***	-0.036***	-0.011***
	(-4.9363)	*(-2.087)*	*(-8.982)*	*(-2.698)*	*(-2.460)*
Leverage	*-0.014****	*-0.006*	*0.000*	*-0.014*	*-0.007*
	(-4.116)	*(-0.972)*	*(0.091)*	*(-0.978)*	*(-1.047)*
Assets Turnover	0.016**	0.004	0.018***	0.106	0.032***
	(1.957)	*(0.548)*	*(2.565)*	*(1.201)*	*(-2.031)*
Adjusted R-squared	0.330	0.149	0.191	0.304	0.547

Dependent Variable: Tobin's Q					
	China	Japan	US	UK	Germany
Female presence as Executives	0.405***	1.809	0.337**	0.772	1.368***
	(2.098)	*(1.221)*	*(1.858)*	*(1.010)*	*(-2.077)*
Firm Size	-0.198***	-0.068***	-0.221***	-0.216***	-0.200***
	(-8.252)	*(-2.970)*	*(-11.687)*	*(-4.688)*	*(-3.303)*
Leverage	-0.074***	-0.040***	0.001	0.036	-0.022
	(-2.309)	*(-0.976)*	*(0.350)*	*(0.209)*	*(-0.251)*
Assets Turnover	0.055	-0.014	0.130***	0.219	0.019
	(0.709)	*(-0.155)*	*(3.000)*	*(0.955)*	*(0.091)*
Adjusted R-squared	0.450	0.111	0.305	0.511	0.450

Note: T-statistics are in parentheses. *, ** and *** refer to significance at the 10%, 5% and 1 % levels, respectively.

Compared to the results of the female board representation analysis, the level of female executives in corporates show a stronger positive association with firm performance under both the financial performance and market sentiment perspectives. This may imply that women make more significant contributions to firm performance and market perception in senior executive management roles than as board members. In order to understand the impact women potentially bring at senior executive level to firms, it is useful to analyse each country under both firm performance measurements.

Under the financial performance perspective, there is a positive correlation between female executive representation and ROA for all five countries, which is statistically significant at either the 1% or 5% level for the US and Germany, but not for the other countries. The strongest association is found for the UK, and the weakest for China. From the market sentiment perspective, a very strong association was found between the presence of female executives and the Tobin's Q of firms across the five countries examined, and the results for China, the US and Germany were statistically significant at either the 1% or 5% level.

These findings support the hypothesis that companies with a higher female top executive presence are rewarded by the market with a higher market value to net asset value (Tobin'sQ) in all five countries. However, this effect seems to be the strongest in Japan, where the environment for women occupying senior positions was found by Terjesan and Singh (2008) to be particularly negative. This is followed by Germany and the UK, with China and the US displaying the weakest (but still fairly strong) association.

Similarly, in the executive management models, the majority of the control variables werealso found to be statistically significant for both the financial performance and market sentiment measurements.

In both the financial performance and market valuation models, firm size was found to be inversely related to firm performance, in all cases with a statistical significance of 1% or better. Thus, the larger firms in the sample generally seem to experience lower levels of financial performance. The impact of this variable is generally quite small in the financial performance models, but somewhat greater in those focussed on market valuations. This result is consistent with that of Dezső and Ross (2008), who found a negative but weaker association between Tobin's Q and firm size in their study. On the other hand, Darmadi (2010), using data of Indonesian listed firms for the pre-global-financial-crisis period, foundthat larger firm tend to perform better financially and achieve higher ROAs, albeit for a veryspecific data set. Whether investors value assets in smaller firms higher, as found in this study, therefore remains a topic worth examining further.

The results for the relationship between levels of leverage and firm performance was more mixed, with an inverse relationship found for both firm performance measures (ROA and Tobin's Q) for China, Germany and Japan, a very weak positive relationship for the US, and differing signs for the UK under the two performance measures. However, these results were only found to be statistically significant for the Chinese and Japanese corporates. This finding was similar to those of Dezső and Ross (2008), who discovered a negative but stronger relationship in their study. Although the impact of leverage on firm performance varied in this study, the overall tendency was towards a negative impact.

Asset turnover was found to be a statistically significant variable (1% level of significance) for all regions except for Japan and UK in the financial performance models, but only for the US in the Tobin's Q models. A positive association was found for this variable in all cases, except for the Japan Tobin's Q model. Both Muritala (2012) and Pouraghajan and Malekian (2012) also found evidence that asset turnover is positively related to firm performance. The general conclusion is therefore that a more efficient use of assets results in both better financial performances, and the market valuation of assets.

4.3.3 Comparing the Results of the Female Board and Executive Representation Effects

It is further useful to compare the results of the regressions testing the correlation between female board and executive presence with firm results. Although female board representation was found to have a positive impact on firm performance both from the financial performance and market sentiment perspectives across all the countries tested, these results were not statistically significant except for the case of US under financial performance measurement. However, the results for female executive representation was found to be highly statistically significant (for the US, Germany and China) and positively associated with both corporate financial performance and market rating. In particular, the results do not provide sufficient evidence to suggest that having more women on corporate boards improvescorporate financial performance, or boost market sentiment towards firms, except for American firms. However, the hypothesis that more women executives improves firm profitability and investors' valuation of firm assets is statistically supported by the results for firms in the US and Germany, and for Chinese firms under market rating perspective. This implies that women significantly contribute to corporate results through being in senior executive positions, but not necessarily through their presence on corporate boards other thanAmerican firms 'boards.

A possible reason could be that women's judgements and decision making powers may be reduced when they are part of the corporate board due to possible compromises or the dominating influence of the male directors, especially, as is mostly the case, where women

are in a small minority in corporate boards. However, as senior executives, women have more autonomy and power to make decisions and influence company actions and would rely more on their own judgement. The characteristics Del Giudice (2015: 753) suggests that women may possess, such as detail-orientation, empathy and caution, could also have a larger impact on firms at an executive level, due to the more operationally focused responsibility these roles entail.

This finding suggests that firms could benefit from an increase in the number of womenacting as senior executives, and that the focus should be on this aspect of female representation rather than an incremental increase in female board presence.

4.4 Interpretation in terms of Potential Cultural Effects

The findings of the descriptive statistics, as well as of the regression models for both female board and female top executive correlations with firm performance, can be interpreted within the context of cultural differences between the various countries.

The extent of the association between female board representation and corporate performance varies across the countries studied. As was discussed in Chapter 2, under different cultural environments, women may behave differently, and have different impacts, within the workplace. This suggests that the cultural differences between the regions could affect the extent to which female's representation influences corporate performance. Thus, it is worth comparing and analysing the results of this study across countries with different cultural and value systems.

The underlying hypothesis is that in a more open-minded environment, women may be more encouraged to contribute their specific views and skills, which in turn could impact such corporates differently to those solely dominated by men. The expectation is that this may be more the case in countries such as the US or the UK or Germany, compared to conservative environments which may discourage the empowerment of women and cause them to restrain themselves from contributing significantly. Examples of the latter, to varying degrees, may include China and Japan.

4.4.1 Female Board Representation Impact and Culture

From a descriptive statistics perspective, female representation at board level in the Western corporates was found to be larger than that in the Asian ones. Thus, the sample firms in the three Western nations (the US, the UK and the Germany) achieved a rate of female board representation that is almost double the rate in Chinese corporates, and five times that of the Japanese firms. This difference in female board representation can possibly be explained by cultural differences that exist across the various regions, *i.e.* the attitudes towards women's

roles in corporates based on the different the Western and Asian cultural perspectives. This could affect female representation at senior levels in corporates, and the more reserved Asian cultures may also affect their empowerment and behaviour within firms.

As expected, the UK seems to display the strongest impact on firm performance from the empowerment of women in board positions, followed by the US. Although the US and the UK have different cultural systems, they both value the equality of opportunity, individualism and independence. This cultural environment may allow women to voice opinions more openly and pursue senior positions more freely, at least compared to the other countries in the study. Thus, it could be expected that in these cultural environments, the relationship between female representation and firm performance could be stronger. Similarly, on a comparative basis, the evidence from the Tobin's Q models seem to indicate that the market tends to favour firms with higher female board representation more in the US and the UK compared to the other countries studied.

Germany is an interesting case. In the sample Germany displayed the highest average female board representation (at around 25%), which is above that of the UK (around 24%) and the US (approximately 22%). Despite this, the coefficient of female board representation with regards to firm financial performance was substantially lower for Germany, compared to the latter two countries. Thus, even though within the study sample female representation on German firm boards were comparatively high, the evidence seems to indicate that their impact is relatively weak. A possible cause could be the rather conservative system of valueswithin German corporates, which may hinder their ability to have an impact within the firm board environment. Further, with regards to the Tobin's Q model, Germany was the only country to display a negative relationship between female board representation and the market valuation of firms. Thus, the external environment in Germany does not seem to encourage the promotion of gender equality either, as investors seem to value German corporates with more women on corporate boards less.

Female board representation in the sample is significantly lower for the Asian countries, at just less than 11% for China and less than 5% for Japan. This is indicative of cultural biases in these countries. The estimate of the female board representation effect for both China and Japan are further far lower than that of both the US and the UK. As indicated in Chapter 2, China upholds modesty and emphasises relationships and, as a result, Chinese women may tend to restrain themselves from voicing opinions openly and display a humbler behaviour at workplace. This could explain the lower level of financial performance improvement associated with Chinese corporates with increased female board representation.Japan similarly

has a very conservative male-dominated culture, highly valuing modest and polite individuals, and not generally encouraging female participation at a higher corporate level, as indicated by the female board participation numbers above. This could explain the weak relationship between firm financial performance and female board representation in Japan.

4.4.2 Female Top Executive Representation Impact and Culture

While board level decisions affect strategy, top executive management decisions affect operational actions and implementation. The skills required therefore differ between board and management levels. Further, women in senior executive positions have more freedom to impact company actions than women on boards, where they function as part of a committee where they are typically in a minority.

From the descriptive statistics perspective, organisations in the UK and the US again achieve a higher female top executive representation rate than that of China and Japan. However, in this case, German female representation is lower than the US and the UK. As in the case of the corporate board comparison, Japan again achieved a significantly lower level of women's representation at top executive level than the other countries studied. As indicated before, this could partly be linked to the unfavourable attitude towards women in corporates that is rooted in Japanese culture, as argued by Allen and Sakamoto (1999).

The evidence from the regressions described above is more surprising with regards to the possible impact of female senior executive representation on firm performance. With regards to financial performance, although the highest coefficient is still found for the UK, inthis case Germany and Japan follows, with the US and China displaying the weakest links. These results are not entirely consistent with the theory regarding the cultural differences between the five countries. The most surprising results are the high coefficients for Japan andGermany. The latter may be due to the very small sample size of 28 companies, which may not be fully representative of the German economy, which the Japanese result could be skewed by the great majority of Japanese companies (73% of the sample) that have no femaleexecutives at senior level at all. This statistic supports the view of Japan as a male-dominatedculture, including in the business world. A further finding is that the Tobin's Q for Japan displays the greatest sensitivity to an increase in women in top executive management positions, possibly because the base is quite low and, from the market's perspective, companies with women in top management really stand out. In addition, the trend discovered in Japanese companies could be considered as a future research direction, particularly when more data become available.

Chapter 5: Conclusion

Women are still significantly underrepresented in corporate leadership positions, but gender-diversity in corporates may have an impact on firm financial performance. Specifically, women are thought to, in general, have a collaborative leadership style that improves team cohesiveness, and improves corporate strategic decisions through prudence and humanisation (Garfinkle, 2016). The impact of a greater female presence in firm leadership could result from both the board and top executive levels, with the former affecting corporate strategic decision making, and the latter firm actions at a more operational level (Barlow, 2016). There is some academic evidence of a correlation between female representation at both the board and top executive level and corporate financial performance[10].

This study investigated the relationship between female representation corporate boards and top executive levels, by performing regressions on data from listed corporates in China, Germany, Japan, the UK and the US. Consistent with most past studies, a positive association was discovered between female's board presence and corporate financial performance and market valuation. However, except for the case of the US under the financial performance perspective, the majority of the positive associations were not found to be statistically significant, thus failing to provide compelling evidence for the hypothesis that greater female representation in corporate leadership is associated with better corporate performance.

As in the case of female board representation, female representation at top executive level was found to be positively correlated with corporate performance, both from the financial and market valuation perspectives. In addition, this positive association was found to be statistically significant for the US, Germany and China, but not for Japan and the UK, which is partially consistent with the hypothesis that greater representation of women as top executives positively impacts corporate performance. Thus, the evidence suggest that women representation may have a greater impact at the operational level compared to the strategic level in the US, Germany and China, but the difference is not as clear for the UK and Japan. Possible reasons for this could be that board decisions are joint decisions, and that in order to have a real impact on these decisions there could be a minimum threshold required level of female representation. Thus, for example, Joecks, Pull and Vetter (2013) showed that a significant positive relationship with firm performance in observed only when 30% or more of directors are women. On the other hand, top executives generally have far more personal autonomy and authority in decision-making, and thus may have a more direct impact.

[10] Examples include studies performed by Erhardt, Werbel and Shrader (2003), Trinh et.al (2018), Luo, Xiang and Huang (2017), Reinert, Weigert and Winnefeld (2016), and Dezső and Ross (2008).

Although greater female representation in positions of corporate leadership may potentially benefit organisations at both the strategic and operational levels, the extent of this impact could vary across countries as a result of different cultural attitudes towards gender roles and identities. In this study, this theory was investigated by comparing the strength of association between female board and top executive level representation and firm performance measures in the context of selected Asian (China and Japan) and Western (Germany, the UK, and the US) cultures. In terms of descriptive statistics, within the sample it seems that women in the three Western countries tend to have a greater level of representation at the board and top executive level than for the Asian countries.

The positive association between female board representation and firm performance tends to be stronger in the Western than the Asian sample countries, but this does not necessarily apply at the female executive level, where the findings are more mixed between the various cultures. This variation in correlation between female representation and firm performance could be drivenby cultural differences between the societies from which the sample was drawn. Thus, in more open-minded cultures with a respect for gender-equality (*i.e.* Western cultures in this study), women may be able to raise their opinions more freely and have greater impact on organisations. On the other hand, in more conservative value systems (*e.g.* Asian cultures), women's behaviour and influence may be more constrained. This cross-country investigation of the correlation between female representation in business leadership and firm performance, with specific consideration of culture, has to the author's knowledge not been done before.

This study finds some evidence, although not conclusive, of a positive impact of female representation at top executive level in particular, on the performance of the listed firms across three Western and two Asian countries. This is an extension if the current knowledge in this field, which has mostly focused on board level female representation. Furthermore, the analysis of the results of this study highlights the possible effects of cultural contexts on the influence and impact of female leaders in corporates across different countries. As a more open-minded culture encourages a freer expression of female opinions and actions within a corporate environment, firms should consider developing a more open culture that is encourages women to express themselves. In view of the results of this study with regards to women at top executive level, firm should further consider developing women into roles of firm leadership at executive level.

The above findings would thus have the following implications. Given the evidence of a possible positive impact of female representation in business leadership on firm performance found in this study, the implications is that firms should consider promoting more women to

corporate board and top management level to achieve greater success. In addition, cultural norms may have an effect on female leaders' influence in corporates. Therefore, corporates may need to establish and develop a more open-minded culture in order to encourage women to express their opinions and have greater influence on decision making.

However, the findings of this study are incomplete, particularly with regards to the investigation at the executive level. This represents an opportunity for further research on the impact of female executive representation in corporates on firm performance once more data becomes available. In addition, the minimum threshold of female board or executive representation required in order to impact firm performance is an area of potential future research. Lastly, hypotheses such as that firms with more female directors or executives may be more likely to be free of problematic issues such as compensation and communication problems and male-dominated clubs, and promote transparency, all of which may result in better firm performance, could be considered as potential areas for future research.

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APPENDIX A: MODEL SELECTION TESTS

Table A-1: Lagrange Multiplier Test for Random Effects model vs Pooled OLS model

H0: the variances of the individual-effect error are zero

Country	Independent Measures	
	ROA	Tobin's Q
China	30.906***	36.547***
Japan	21.472***	43.109***
US	15.816***	25.04***
UK	4.6868***	23.211***
Germany	11.503***	13.865***

* Statistical significance <0.10, ** Statistical significance <0.05, *** Statistical significance <0.01

Table A-2: F-Test for Random Effects model vs Pooled OLS model

H0: the binary variable parameters are zero, i.e. there are no fixed effects

Country	Independent Measures	
	ROA	Tobin's Q
China	8.2544***	12.244***
Japan	5.5879***	29.817***
US	3.7893***	17.577***
UK	15.295***	28.852***
Germany	9.3944***	26.673***

* Statistical significance <0.10, ** Statistical significance <0.05, *** Statistical significance <0.01

Table A-3: Hausman Specific Test for Random Effects model vs Pooled OLS model

H0: Random Effects model is preferred than the Fixed Effects model

Country	Independent Measures	
	ROA	Tobin's Q
China	0.30912	1.2267
Japan	1.173	3.3191
US	1.1926	1.053
UK	0.013218	0.65018
Germany	0.01008	0.02783

* Statistical significance <0.10, ** Statistical significance <0.05, *** Statistical significance <0.01

APPENDIX B: MODEL DIAGNOSTICS

Table B-1: Breusch-Godfrey/Wooldridge test for serial correlation (autocorrelation) in panel models

H0: no serial correlation (autocorrelation)

Country/Model	Independent Measures	
	ROA	Tobin's Q
China	401.19***	548.44***
Japan	246.7***	659.4***
US	126.89***	304.2***
UK	3.7318**	180.38***
Germany	50.651***	88.144***

* Statistical significance <0.10, ** Statistical significance <0.05, *** Statistical significance <0.01

Table B-2: Durbin-Watson test for serial correlation (autocorrelation) in multiple regression models

H0: the autocorrelation of the disturbances is 0

Country/Model	Independent Measures	
	ROA	Tobin's Q
China	1.6972***	1.4016***
Japan	1.6293***	1.3272***
US	2.05	2.0328
UK	1.7503	1.5468**
Germany	1.4117*	2.0104

* Statistical significance <0.10, ** Statistical significance <0.05, *** Statistical significance <0.01

Table B-3: Breusch-Pagan test for homoskedasticity in panel models

H0: The null hypothesis is homoskedasticity

Country	Independent Measures	
	ROA	Tobin's Q
China	227.37***	91.112***
Japan	123.71***	162.94***
US	26.634***	41.967***
UK	1338***	143.87***
Germany	5.7761	27.756***

* Statistical significance <0.10, ** Statistical significance <0.05, *** Statistical significance <0.01

Table B-4: Breusch-Pagan test for homoskedasticity in multiple regression models

H0: The null hypothesis is homoskedasticity

Country	Independent Measures	
	ROA	Tobin's Q
China	48.406***	28.607***
Japan	38.013***	50.777***
US	27.964***	22.311***
UK	440.79***	36.837***
Germany	1.3698	4.9177

* Statistical significance <0.10, ** Statistical significance <0.05, *** Statistical significance <0.01

Table B-5: Shapiro-Wilk test for normality in residuals in panel models

H0: residuals are normally distributed

Country	Independent Measures	
	ROA	Tobin's Q
China	0.90508***	0.92971***
Japan	0.87676***	0.91235***
US	0.88872***	0.95544***
UK	0.59105***	0.97202***
Germany	0.94889***	0.98964

* Statistical significance <0.10, ** Statistical significance <0.05, *** Statistical significance <0.01

Table B-6: Shapiro-Wilk test for normality in residuals in multiple regression models

H0: residuals are normally distributed

Country	Independent Measures	
	ROA	Tobin's Q
China	0.93542***	0.93311***
Japan	0.93783***	0.84897***
US	0.92232***	0.96646***
UK	0.67762***	0.95624***
Germany	0.94096**	0.96987

* Statistical significance <0.10, ** Statistical significance <0.05, *** Statistical significance <0.01